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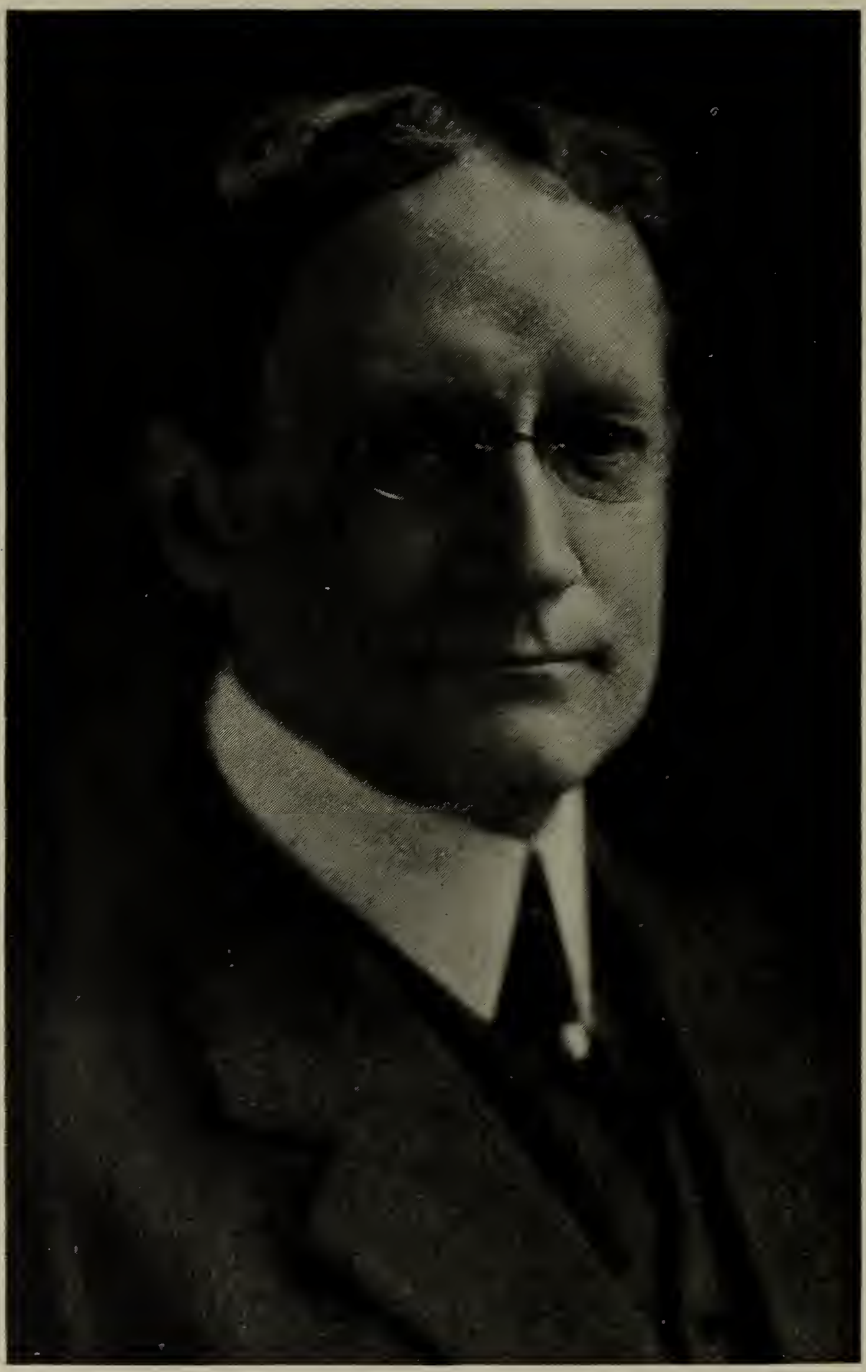

ARTHUR T. MANN

PRESIDENT, 1920

CAT.

THIRTIETH ANNUAL MEETING

TRANSACTIONS

OF THE

WESTERN SURGICAL ASSOCIATION

Thirtieth Annual Meeting

Los Angeles, Calif., December 3 and 4, 1920

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OFFICERS AND EXECUTIVE COMMITTEE

1920

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Charles D. Lockwood, M. D. - - - - Pasadena

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Harry P. Ritchie, M. D. - - - - - St. Paul

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Roland Hill, M. D. - - - - - - - St. Louis

James F. Percy, M. D. - - - - - - San Diego

August F. Jonas, M. D. - - - - - - Omaha

William T. Coughlin, M. D. - - - - St. Louis

EX-PRESIDENTS AND MEETING PLACES

PRESIDENT	PLACE	YEAR
S. S. Todd*	Topeka	1891
Milo B. Ward*	Kansas City	1892
Milo B. Ward*	Des Moines	1893
Lewis Schooler	Omaha	1894
John E. Summers, Jr.	Kansas City	1895
Thomas J. Beattie	Topeka	1896
Joseph Eastman*	Denver	1897
David S. Fairchild	Omaha	1898
Homer C. Crowell	Des Moines	1899
O. Beverly Campbell	Minneapolis	1900
August F. Jonas	Chicago	1901
James E. Moore*	St. Joseph	1902
Alex. Hugh Ferguson*	Denver	1903
Charles H. Mayo	Milwaukee	1904
Harvey D. Niles*	Kansas City	1905
Malcolm L. Harris	Salt Lake City	1906
Charles W. Oviatt*	St. Louis	1907
William W. Grant	Minneapolis	1908
Arthur L. Wright*	Omaha	1909
John P. Lord	Chicago	1910
Amos W. Abbott	Kansas City	1911
Lewis L. McArthur	Cincinnati	1912
Jabez N. Jackson	St. Louis	1913
Byron B. Davis	Denver	1914
Joseph Rilus Eastman	Des Moines	1915
Lawrence W. Littig*	St. Paul	1916
Leonard Freeman	Omaha	1917
James F. Percy	Chicago	1918
Roland Hill	Kansas City	1919
Mann, Arthur T.	Los Angeles	1920

*Deceased.

The Western Surgical Association does not hold itself responsible for, or necessarily endorse, any of the papers printed herein.

WARREN A. DENNIS, M. D., Secretary-Treasurer

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Executive Session

Transactions of the Thirtieth Annual Meeting

Held in Los Angeles, California

December 3 and 4, 1920

December 3, 1920—First Day—Morning Session

The Association met at the Hotel Alexandria, Los Angeles, California, and was called to order at 9:35 a. m. by the President, Dr. Arthur T. Mann, Minneapolis, Minnesota.

Dr. N. J. Maclean, Winnipeg, Manitoba, Canada, read a paper entitled "Indications for Nephrectomy in Renal Stone," which was discussed by Drs. Sweetser, Davis, Pearse, Benjamin, and, in closing, by the essayist.

Dr. Henry H. Sherk, Pasadena, California, followed with a paper entitled "Epidermoid Cysts." This paper was discussed by Drs. Black and Coughlin, and, in closing, by the essayist.

Dr. James F. Percy, San Diego, California, read a paper entitled "A New and Advanced Treatment of Breast Cancer," with lantern illustrations. This paper was discussed by Drs. Wetherill, Freeman, Plummer, Davis, Jonas, Smith, and, in closing, by the author of the paper.

The local committee on arrangements made announcement concerning the luncheon to be held at noon at the Hotel Alexandria, and also arrangements for the meeting the following day.

Dr. Harry P. Ritchie, St. Paul, Minnesota, read a paper entitled "A Group Plan for the Description and Discussion of Harelip and Cleft Palate Defects." This paper was illustrated by lantern-slides, and was discussed by Drs. Lockwood, Sherman, Coughlin, Benjamin.

Dr. Frederick G. Dyas, Chicago, Illinois, read a paper entitled "The Control of Chronic Pain," which was discussed by Dr. Percy.

The Secretary read a communication from Dr. Joseph R. Eastman, Indianapolis, Indiana, stating his inability to attend the meeting and to read his paper entitled "Rationale of Regional Anesthesia."

A telegram was received from Dr. John E. Summers, Omaha, Nebraska, stating his inability to be present and read his paper on the "Clinical Effects of Intramuscular Injection of Calcium Chlorid in Advanced Cancer: What May be the Significance?"

On motion the Association adjourned until 2:30 P. M.

First Day—Afternoon Session

The Association reconvened at 2:30 P. M., and was called to order by the President.

Dr. Arvine E. Mozingo, Indianapolis, Indiana, read a paper entitled "The Surgical Treatment of Empyema by a Closed Method."

On account of the electric current being out of order, the films in connection with Dr. Mozingo's paper were deferred, together with the discussion, until after the reading of the next paper.

Dr. Arnold Schwyzer, St. Paul, Minnesota, read a paper entitled "Notes on Surgery of the Mediastinum."

The moving picture films on Dr. Mozingo's paper were then shown, and discussed by Dr. Quain and, in closing, by Dr. Mozingo.

Dr. Otis F. Lamson, Seattle, Washington, read a paper entitled "Movable Bodies in the Knee Joint," which was discussed by Drs. Henderson, Lord, Sala, and Ritchie.

Dr. Melvin S. Henderson, Rochester, Minnesota, read a paper entitled "Habitual or Recurrent Dislocation of the Shoulder Joint," which was accompanied by lantern slides, and was discussed by Dr. Jonas.

Dr. Herman E. Pearse, Kansas City, Missouri, followed with a paper entitled "The Removal of Sacrococcygeal Tumors (Middledorpf Tumors) by the Posterior Route," showing lantern slides.

On account of an Executive Committee meeting, the President asked Dr. Leonard Freeman to preside for the remainder of the session.

Dr. Arthur E. Benjamin, Minneapolis, Minnesota, read a paper entitled "Technic and After-Treatment in Operations on the Prostate," which was discussed by Drs. Maclean, Freeman, and, in closing, by the essayist.

On motion the Association adjourned to meet at 9:30 A. M., Saturday, December 4, at the Valley Hunt Club, Pasadena.

The usual banquet of the Association was held Friday evening, December 3, at the Hotel Alexandria, at which the President, Dr. Arthur T. Mann, Minneapolis, delivered the president's address.

December 4—Second Day—Morning Session

The Association met at the Valley Hunt Club, Pasadena, at 9:50 A. M. and was called to order by President Mann.

Dr. Byron B. Davis, Omaha, Nebraska, read a paper entitled "Are We Getting Satisfactory Results in Stomach Surgery?" The paper was accompanied by lantern slides, and was discussed by Drs. Freeman, Sala, Mozingo, Pearse, Schwyzer, and Moore, and, in closing by the author of the paper.

Dr. Samuel Robinson, Santa Barbara, California, read a paper entitled "Acute Obstruction of the Small Intestine," which was discussed by Drs. Hill, Dyas, Pearse, Sweetser, Quain, and Coughlin.

Dr. Maurice Kahn, Los Angeles, California, read a paper entitled "Congential Absence of the Colon," which was discussed by Drs. Davis and Sweetser.

The other three papers on the morning program were not read on account of the absence of the authors, one of which was by Dr. Willard D. Haines, Cincinnati, Ohio, on "Diseases of the Pancreas."

Telegrams were received from Dr. William T. Reynolds, Kansas City, Missouri, stating his inability to be present and to read his paper on "Pathological Gall-Bladders (not Gall-Stones or Infection)," and also from Dr. Arthur C. Stokes, Omaha, Nebraska, who was to have read a paper on "The Treatment of Osteomyelitis."

Dr. Horace G. Wetherill, Denver, Colorado, read a paper entitled "Who's Who in the Hospital? An Attempt at Constructive Criticism."

This paper was discussed by Drs. McKinnie, Sherman, Black, McGraw, Sala, Sweetser, and Coughlin, and, in closing, by the author of the paper.

On motion, the Association then adjourned to meet at 2:30 P. M.

Second Day—Afternoon Session

The Association reconvened at 3:10 p. m., and was called to order by the President.

Dr. Roland Hill, St. Louis, Missouri, read a paper entitled "Laminectomy with Spinal Drainage for Acute Meningitis, with Report of Two Cases."

The paper was discussed by Drs. Leighton and McGraw, and, in closing, by the essayist.

The Secretary of the Association, Dr. Warren A. Dennis, presented the following report of the Executive Council, together with the Secretary-Treasurer's report:

Report of the Executive Council.

There were present at the meeting of the Executive Council, the following members: Drs. Hill, Mann, Jonas, Percy, Quain, Lockwood, and Dennis.

The following recommendations were made: For next place of meeting—St. Louis.

Chairman of the Committee of Arrangements, Dr. Wm. E. Leighton.

For officers:

President, Dr. Charles D. Lockwood, Pasadena.

First Vice-President, Dr. Herman E. Pearse, Kansas City.

Second Vice-President, Dr. Harry P. Ritchie, St. Paul.

Secretary-Treasurer, Dr. Dennis, St. Paul.

On request from the American College of Surgeons the following three members were nominated to serve on the Board of Governors:

Dr. August F. Jonas, Omaha.

Dr. Samuel Plummer, Chicago.

Dr. Robert C. Coffey, Portland.

On motion, made and passed, the Secretary was directed to send a telegram to Dr. Vilray P. Blair, of St. Louis, who was recently seriously injured in an automobile accident, expressing the regret of the Western Surgical Association at his inability to be present and the hope for a speedy and complete recovery. Such telegram was duly sent.

Moved that the acknowledgements of the Association be made to *Surgery, Gynecology and Obstetrics* for the courtesy shown by that journal in the current and previous years in the loan to the Association of numerous illustrations for its transactions. Carried. Moved and carried that the Secretary be instructed to express by letter to Mr. W. L. Klein, of Minneapolis, for some years past the publisher of the Transactions of the Western Surgical Association, the high appreciation of the members for the excellent character of the work he has produced and for the splendid spirit of co-operation in which it has been done.

Moved and carried that the Transactions be sent to certain medical librarians who have made request for them.

Telegrams of regret were received from Dr. J. N. Jackson, Kansas City; Dr. F. R. Teachenor, Kansas City; Dr. J. M. Venable, San Antonio; and Dr. Arthur C. Stokes, Omaha.

The following are nominated as members of the Executive Council for the ensuing year:

Dr. Arthur T. Mann, Minneapolis, Chairman.

Dr. Roland Hill, St. Louis.

Dr. James F. Percy, San Diego.

Dr. August F. Jonas, Omaha.

Dr. William T. Coughlin, St. Louis.

The following applicants are recommended for election to membership:

Adson, Alfred W., Rochester, Minn.

Attix, Fred F., Lewiston, Mont.

Bendixon, Peter A., Davenport, Iowa.

David, Vernon C., Chicago, Ills.

Graham, Evarts A., St. Louis, Mo.

Harris, Rowland H., Battle Creek, Mich.

Masson, James C., Rochester, Minn.

MacDonald, James W., Aurora, Ills.

McKay, Harvey S., St. Louis, Mo.

Porter, John L., Chicago, Ills.

Powell, Cuthbert, Denver, Colo.

Toland, Clarence G., Los Angeles, Calif.

Wallace, Hilen K., St. Joseph, Mo.

Williams, Aubrey H., Denver, Colo.

Moved and carried that in the future only candidates who are members of the American College of Surgeons shall be eligible to election to membership in the Western Surgical Association.

Treasurer's Report

Receipts

Balance received from former Treasurer April 15, 1920	$1,079.48	
Dues received to December 1, 1920	630.00	
		$1,709.48

Disbursements

Wm. Whitford for reporting meeting of 1919	$ 196.36	
Cole & Wickham, Printing	18.57	
Brown, Blodgett & Sperry for ledger	2.00	
W. A. Keller Co. for printing	94.35	
Returned checks	60.00	
Postage	11.00	
Stenographer	3.00	
Secretary honorarium	100.00	
		485.28
Balance on hand December 1, 1920		$1,224.20

On motion, made and seconded, the report of the Secretary-Treasurer was adopted.

It was moved and seconded that the report be accepted as presented. Carried.

Dr. Roland Hill moved that the Association extend its thanks to the local committee of arrangements for the splendid manner in which they had provided for the meeting.

Seconded and carried.

Dr. Jonas, on behalf of the Association, expressed thanks for the hospitality, courtesy, and friendship manifested by the members of the Committee of Arrangements.

Dr. Byron B. Davis was appointed a committee of one to conduct the newly elected President, Dr. C. D. Lockwood, of Pasadena, California, to the chair.

Dr. Lockwood not only thanked the Association for the distinguished honor conferred upon him, but made a few remarks concerning the high class work done by the Association. At the special request of Dr. Lockwood, Dr. Mann continued to occupy the chair for the remainder of the session.

Dr. William E. Leighton, St. Louis, Missouri, read a paper entitled "Section of Anterolateral Tract of the Cord for the Cure of Intractable Pain Due to Spinal Cord Lesions," which was accompanied by lantern slides.

Dr. William T. Coughlin, St. Louis, Missouri, followed with a paper entitled "Fifth Root Resection Under Local Anesthesia."

These two papers were discussed together by Drs. Coughlin and Leighton.

Dr. Horatio B. Sweetser, Minneapolis, Minnesota, read a paper entitled "Splenectomy in the Third Stage of Banti's Disease, with a Report of a Case Sixteen Months After Operation," with slides.

Dr. Guy Cochran, Los Angeles, California, read a paper entitled "Primary Sarcoma of the Spleen," which was discussed, in conjunction with the paper of Dr. Sweetser, by Dr. Lockwood, after which the discussion was closed by Dr. Sweetser.

As there was no further business to come before the meeting, on motion, which was duly seconded and carried, the Association adjourned to meet in St. Louis, Missouri, December, 1921.

WARREN A. DENNIS, M. D.

Secretary-Treasurer.

President's Address

THE WESTERN SURGICAL ASSOCIATION

ARTHUR T. MANN, M. D., F.A.C.S.

Mr. Toastmaster, Members of the Association, and Guests:

I have taken as my subject tonight "The Western Surgical Association."

The Western Surgical Association! What a sturdy child it is that was launched in this land of the West, where the young men came to take possession and where, with energy, with foresight, and with brains, they have labored for the good things of the earth—for broad lands and a competence, yes; but for self-expression, for the development of the best that is in them, with high ideals, with enthusiasm untrammeled, and with a vision. Is there any wonder, when our Association has drawn its members from such men as these, some of whom have grown to middle age, increasing in their powers, wiser with their years, still pointing the way to better things—is there any wonder that our Western Surgical Association takes the high place we give it? In our hearts it is second to none; it is the best. We cherish it because man loves that best which he can best serve. In this association, with its limited membership, each member can make himself felt to the limit of the circle.

There is a community of interest, a community of purpose, and a good fellowship seldom found in a society spread over so wide a territory. And there is good reason for this. Each candidate should be proud

of his election to membership, because he has been scrutinized with unusual care. He has been chosen as one who, while he is well trained and well equipped, cherishes the high ideals of our profession, one who has some enthusiasm and who gives promise of developing a certain amount of power; one who, in addition to his professional qualifications, shows an element of right-mindedness, of good-will, which may endear him to his fellows.

I have always thought of our limited membership as a source of strength. It enables one to choose wisely, because the places to fill are few. The promising men are chosen rather than the inefficient merely because they bring to bear personal pressure and the claims of friendship. It is curious how some qualities which often attract us are enhanced when supplemented by other qualities of mind and character,—the qualities we look for in our members. This limitation in numbers leads us to select for the future rather than for the present—leads us to select the men with native powers and force of personality, men who will wear well, who will be an inspiration to us, men who may become personal friends and wear well in the years to come.

It has been my privilege as secretary, and now as president, to have served the Association for fifteen years. They have been years of pleasure and years of profit. I have given the best that is in me, and I have been repaid many fold for every effort I have put forth. It has been my endeavor to help make the work of the Association run smoothly, to correlate it so that it might be effective. The task in the main has been an easy one. When one looks about and sees the wealth of material we have in the men who are here present, and remembers those who have not been able to come this great distance, but who are almost always with us, one must realize that the strength of the Associa-

tion lies in its members, active, virile, always offering the best fruits of their experience.

Our programs have been full and running over. It has been difficult, often, to eliminate from the wealth of material offered, so that they might not be overburdened, but might be compact, co-ordinate, effective. There has been the purpose, also, to make the influence felt from year to year, to make the work progressive, to inspire others with the desire to work further into conclusions which will be lasting, and so to add to our knowledge in subsequent years. And this has often come about. Those of you who are within the sound of my voice will know how you have been stirred, time and again, by what you have heard from the various members of this organization. Sometimes it has been the gathering together of a rich experience; sometimes it has been the presentation of original work; sometimes it has been the result of a broad grasp of a subject which has been treated with high reasoning and a clear insight so that it has crystallized the work and the thought of a decade, and given us a new foundation to stand upon as we build toward the future.

A paper of original work has led to further original research, sometimes by those who heard it, sometimes by the man himself, who feels the sympathy of his audience and their attitude of encouragement. The thoughtful presentation of personal experiences has touched a responsive memory in others, has stimulated their imagination until they realize the underlying reason and meaning of the experiences they themselves have had. They become better men, and go back to their work with more enthusiasm, determined to do it better, and in the coming years they bring the results back to us.

Fine as have been our papers in the main, it has often seemed to me that the discussions which they have call-

ed forth have sometimes excelled them in inspiration. Untrammeled as they are by the necessities of a paper which force its development along broad lines and make necessary, for completeness of development, the inclusion of much material that is of secondary interest and of much which is already well known, the discussions run with a freedom from restraint. They are more human, more personal, than the formal papers. They amplify and enrich the development of the theme. When a man reads a paper into which he has put hard work and clear thinking, bringing him slowly to conclusions of real value, how often he is charmed by the quick touch and go of the discussion! A pointed experience, a close analysis, a clear word picture, and the truth is touched into life for our use. The readiness of our members to enter into the discussions shows a versatility, a richness of thought and experience, which is an index of the high quality of our Association. And the spirit manifested in the discussions is always admirable. Commendation is freely bestowed where commendation is due, and the wind is tempered to the shorn lamb, and, though he feels the wind, he feels it as a gentle breeze. Things that are not sound cannot stand such a body of men. Charitable they are, yet firm; kindly, yet unwilling to see the truth obscured.

If a member presents a new type of operation, or an ingenious instrument to save time and make results more sure, the discussion welcomes him. If he becomes a biologist and traces an abnormality through different orders of the vertebrates, and sometimes well into the invertebrates where it occurs normally, to catch the law of nature which controls, and to make use of it for greater perfection, the discussion warms to him. If he becomes a physiologist and seeks the underlying vital forces and endeavors to harness them for his uses and to gain better results than he could be served by mechanical means alone, the discussion makes him feel

at once the quick sympathy and ready appreciation of a body of men before whom it is an honor to present his thesis.

We learn to know the men better in the discussions than in the formal papers; their personality is more magnetic, more forceful. It is always in evidence. It underlies all they say and gives it special meaning. Here, in the spontaneous freedom of their expressions we best gauge their value, the breadth of their conceptions, the richness of their minds.

Our Association has come through many years of profit to its members. They have been years in which its members have grown in strength and wisdom, and the results have been reflected in our Association. As individuals they have been active in working for the best interests of surgery and have brought back to us, year after year, the fruits of their labors. They have been doing better surgery; they have been striving to do surgery in a better way. They have been urging a better diagnosis, a more complete study of a case by all the facilities which can be brought to bear,—a careful, thoroughgoing history; all the information well-organized laboratories can give, and the associated studies of specialists in other fields of medicine. Years ago, A. F. Jonas, of Omaha, made a strong plea for well-equipped laboratories, well run and properly manned. Malcolm L. Harris, of Chicago, made a most searching study into the sifting of "Testimony and Evidence in Medicine," and its relative value in arriving at a correct diagnosis. Horace G. Witherill, of Denver, made a plea for "Hospital Standardization" and efficiency. The interest it aroused and the discussion it brought forth had a strong influence in furthering this great advance, which is in the active stage of accomplishment and is now fathered by the American College of Surgeons. Jackson, Grant, Moore, and others urged earnestly the standardization of the sur-

geon, the elimination of the incompetent, the proper training of those who give promise. And Jackson added: "The incompetent should not be branded with an assumed brand of competency. On the other hand, we believe that the time has also come when the man who has honestly trained himself to be a competent and trust-worthy surgeon is entitled to some distinction which will speak such training."

To remind you in another way of some of the work of this Association it is necessary merely to mention by title some of the papers which have been read before us. As I give them many of you will remember something about them—something about the subject matter, something about the personality of the men as they read them, or something about the character of the discussions, all of which went to make them worth while. I shall not go back of the Kansas City meeting, at which I was chosen as your secretary, and I shall select them more or less at random.

In 1905 we had "Cancer of the Breast," by Beverly MacMonagle, in which he advocated that every tumor of the breast should be removed early in its history, should have a careful microscopic examination, and that every case in which there was shown the least question of malignancy should then be subjected to the radical operation and given the best chance for a permanent cure. This was certainly advanced ground to take fifteen years ago. It is an advanced but sound position to advocate today. In the same year Jabez N. Jackson gave "A New Technic for Breast Amputations," an excellent method now used by many of our best surgeons. "An Experimental Study into the Etiology (or cause) of Cancer," by Arthur E. Hertzler, was given in 1907, in which he based his experiments on the action of certain stains, notably Sudan III; and in his paper he assumed "that the balance between epithelium and connective tissue is a chemical

one, and that, when such balance is disturbed, the development of one tissue at the expense of the other is possible."

"The Cancer Question," by John E. Summers, in 1908, and the discussion it brought forth, might stand almost word for word today.

"Cancer of the Hollow Viscera of the Abdomen, with Special Reference to Diagnosis," by Miles F. Porter, and "Observations on the Present Status of Surgery for Cancer of the Breast," by E. S. Judd, followed in 1911. "The Results of Treatment of Cancer of the Uterus by the Actual Cautery," by James F. Percy, in the same year, opened up a subject which has led to much discussion and the smoke is just now clearing away.

The timely and clear paper on "Bleeding Nipples," by Dean Lewis, in 1915, helped to elucidate a vexing problem.

W. W. Grant, in the same year, gave one of the best operations for cancer of the lip, one which he has been doing for many years.

And Wm. M. Harsha added to our knowledge when he brought before us, in 1917, the subject of "Carcinomatous Mastitis."

The "Symposium on the Gall-Bladder," by Harris, Bartlett, Davis, Haines, and others, in 1907; the paper, in 1910, by John E. Summers on "Typhoidal Cholecystitis;" the alluring suggestion of the "Therapeutic Use of the Bile Tracts," by L. L. McArthur in 1911; "End-Results in Gall-Bladder Surgery," in the same year; the question, "How Much Disease a Gall-Bladder May Have and Still Serve Its Purpose," in 1912, by B. B. Davis; "Cholecystitis and the Factors that Control Results of Operation," by C. H. Mayo, 1913; "Suture of the Bile Ducts," in 1915, by T. F.

Riggs; "The Fate of the Cystic Duct after Removal of the Gall-Bladder," by D. N. Eisendrath, in 1917; and the interesting and profitable discussions which these papers called forth from the best minds among us, have brought us abreast with the present, and new experiences will have to be lived through before we shall depart from our present surgical procedures in relation to the gall-bladder and the bile ducts.

Another field of interesting study has been the membranes and kinks and faults of the bowel. In 1908, "Jackson's Membrane," by Jabez N. Jackson, established a new entity in surgical diseases. "Some Anomalies of the Sigmoid," by L. L. McArthur, in 1909, and "Intestinal Obstruction Due to Kinks and Adhesions," by C. H. Mayo, in 1910, together with the papers, "Etiology of the Lane Kink, Jackson Membrane and Cecum Mobile," by F. Gregory Connell, and the "Fetal Peritoneal Folds of Jonnesco, Treves and Reid, and Their Probable Relationship to Jackson's Membrane and Lane's Kink," by J. Rilus Eastman, in 1912, placed this field of surgery fairly before us. The symposium in the following year comprising the three papers, "The Significance of the Jackson Veil," by D. N. Eisendrath; "Pericolic Membranes," by J. Rilus Eastman; and "The Significance of Intra-abdominal Bands, Folds, and Veils," by William Seaman Bainbridge, taken together with the discussion which followed, was brilliant and masterly. It has seldom been surpassed.

The programs which have been presented before this Association have been so filled with good material that it is difficult to select what shall be spoken of, for it is certain that there will be other things of equal merit and in almost equal numbers that cannot be given for lack of time.

The experimental work on surgical shock was of great interest. This was given in the papers, "Fur-

ther Experimental Data on the Vasomotor Relations of Shock," in 1909, by Major G. Seelig; "An Experimental Study of Sodium Bicarbonate and Other Allied Salts in Shock," in 1912; and "On the Condition of the Vasoconstrictor Centre During the Development of Shock," in 1915, by the same investigator, as well as the papers of J. Frank Corbett, "The Adrenal in Relation to Shock," in 1914, and "Treatment of Shock with Epinephrin and Blood-tranfusion," in 1915. The discussions by the men I shall name added materially to the value of the papers: Arthur E. Hertzler, Robert C. Coffey, Malcolm L. Harris, W. W. Grant, Martin H. Fisher, and Joseph C. Bloodgood.

The general subjects pertaining to the surgery of the abdomen were treated in the usual high order expected from the members of this Association. Robert C. Coffey, in 1906, gave the subject, "Principles of Abdominal Drainage," with miles of charts and years of work, and with an enthusiasm which the passing of time only served to strengthen. "The Significance of Tenderness in Locating Lesions of the Viscera," by T. C. Witherspoon, in 1907, was a scholarly paper.

"Transgastric Jejunal Feeding after Gastro-enterostomy, Combined with Gastrostomy," by Arnold Schwyzer, in 1909, gave a new turn in a difficult field. "Diffuse Septic Peritonitis," by B. B. Davis, and "The Present Status of the Treatment," by A. E. Hertzler, in the same year, were followed by Jabez N. Jackson, with "The Retrocecal Appendix," in 1912; by J. E. Moore and J. F. Corbett with "Studies on the Function of the Peritoneum;" by T. C. Witherspoon with "Surgical Handling of the Pus-infected Peritoneum;" by Roland Hill with "Congenital Pyloric Stenosis," and by Charles D. Lockwood with "Ulcer of the Stomach Before the Age of Puberty," in the following year. Excessive Mortality of High Intestinal Obstruction," by W. W. Grant, in 1914, was followed in

1915 by Amos W. Abbott with "Early Diagnosis of Intussusception in Children," which was classic. A. E. Hertzler, in 1916, gave his studies in "The Nature and Genesis of Peritoneal Adhesions," and H. M. Richter presented his paper on "The Perforated Gastroduodenal Ulcer."

Inadequate as is even this long list of papers to suggest more than a small part of the work which has been presented before us, I do not wish to weary you. One would need to analyze the work done in each successive year to do it justice. Practically every member of our organization has contributed to its efficiency and to its success. However, before leaving this phase of my subject, I wish to remind you of the excellent work of Leonard Freeman in "Tuberculosis of the Kidney;" of Emil Beck with "Bismuth Injections in Old Long-standing Tuberculosus Sinuses," and with "The Skin-sliding Flap to Cure Large Empyema Cavities;" of J. Rilus Eastman and Harry P. Ritchie in the "Closure of the Cleft-Palate;" of Mayo, Hertzler, Maclean Judd, and others on the goiter question; of Collins, Nicholson, and Harris in the studies of anesthesia; and of Fairchild in an excellent study of "Massage of the Heart in Apparent Death from Anesthesia."

It has not been possible to enter into a broad analysis of the various features which have made our papers strong. To point out the rich material with which they individually abound or to show the wide fields which they have covered; to indicate the high qualities of mind with which they have been conceived or the force of personality with which they have been delivered, would carry me far beyond the limits of my time.

And now I wish to express our appreciation of the fine spirit of hospitality which the men of these two beautiful cities (Los Angeles and Pasadena) have shown in planning for our pleasure and entertainment

at this meeting. Our Association is an earnest, active body of men, so immersed, as a rule, in the scientific proceedings that we often miss the experiences which give us an understanding of the warm feeling and generous character of our welcome. On the occasion of our visit here, however, we have been filled with anticipations of unusual pleasure and we have been made to feel that we have come to a place so beautiful and with a sojourn so well prepared for us that they will be more than fulfilled.

It was a long journey for most of us to take, but the members who invited us to come have been so faithful in their attendance, have come to us so many times, and have shown such lasting interest in so many ways, that we gladly accept their invitation.

It was fitting that the Association, conceived in the West, should come to this land which shows at its best the beauty, the energy, and the warm hospitality which is characteristic of the West.

THE INDICATIONS FOR NEPHRECTOMY IN RENAL STONE

NEIL JOHN MACLEAN, M. D., M. R. C. S. (EDIN.), F. A. C. S.

WINNIPEG, CANADA

Renal Stone is dealt with surgically by pyelolithotomy, nephrolithotomy, or nephrectomy. The indications for nephrectomy have not been very fully set forth by the writers on renal surgery and the decision as to the necessity for nephrectomy is usually left to the surgical experience and surgical judgment of the operator. One well-known authority, in a monograph on genito-urinary diseases, covers the whole ground with the following statement: "If the kidney is mostly destroyed, if a large pyonephrotic sac is present, or if the remaining kidney tissue is highly inflamed, then nephrectomy is indicated."

A nephrectomy may be either primary or secondary. It is sometimes a most difficult problem to decide when a primary or even a secondary nephrectomy for renal stone should be done. While the golden rule in surgical treatment is, and always should be, conservatism, yet there are cases where, after a conservative operation has been successfully performed, symptoms have returned, the primary infection having persisted or stone having re-formed. Until our knowledge of the pathological etiology of renal calculus has been broadened, this must necessarily be the case, for, I believe, at the present time, we cannot foretell in which case stone will re-form and in which it will not. Stones have been removed when infection was present and the infection has disappeared, and in apparently non-infected cases they have returned. Infection appears to

be the most important factor, and when present the chances for recurrence are thereby increased. Neither the length of time in which stone has been present, the size of the stone or stones, nor even the degree of infection is necessarily a contra-indication to a conservative operation. Three years ago I removed a stone that had given symptoms for fourteen years. It was 5 c.m. in its longest diameter and 2 c.m. in its shortest. There was pus in the urine. This patient is now well and entirely free from symptoms. Re-examination of the urine showed it to be free from pus. On the other hand, a very small stone obstructing the upper end of the ureter may lead to such enormous dilatation of the kidney and destruction of its function that nephrectomy would be called for. The following is a case in point.

Mrs. S. had symptoms of renal stone for four years. Pain was not a marked feature in the history. There was pus in the urine, but not a large amount. The radiogram showed a very small shadow in the right renal pelvis. The function of the left kidney was normal. No specimen could be obtained from the right. At first sight it seemed that in this case removal of the stone would be all that was indicated, but when the kidney was exposed at operation, it was found dilated into a large hydronephrotic sac. A stone was impacted at the ureteropelvic junction, the structure surrounding the stone being densely fibrosed. The kidney was removed, the ureter being divided below the stone.

A large pyonephrotic kidney calls for preliminary drainage and secondary nephrectomy. This may require to be a subcortical enucleation, as was done in three of my cases. Rather than secondary nephrectomy the term two-stage nephrectomy might well be applied in these cases.

Tuberculosis of the kidney associated with stone, or stone with tuberculosis, calls for nephrectomy, provided the other kidney is normal. Here the nephrectomy is done for the tuberculosis, and not for the stone necessarily.

Carcinoma likewise calls for nephrectomy if diagnosed early enough to hold out the hope of non-recurrence.

One other condition in which nephrectomy is done might be mentioned in passing. A patient has typical and well-marked symptoms of stone. Radiograms may or may not have located it. When the kidney is exposed no stone can be found. It is needless to say that the removal of the kidney under such circumstances is bad surgery, yet it has been done. Morris, while admitting that he removed a kidney in his earlier experience where the stone could not be found, and that Czerny and Kosinsky had also done the same, mentions the fact only to condemn it.

One of my patients, a man aged 28, was suffering from severe and frequent attacks of left renal colic, accompanied by hematuria. Repeated *x*-ray examinations were negative. Ureteral catheters passed to each kidney without obstruction. An exploratory operation was done, but careful palpation through an incision in the pelvis did not locate any stone. A band of tissue crossing the ureteropelvic junction was divided. No abnormal vessels running to the lower pole were found. The wound was closed, recovery was normal, and the patient was apparently well. Seven months later he had a return of colic and passed a small uric-acid stone.

The use of a portable *x*-ray machine in the operating-room will help materially in locating a stone when the kidney is exposed. This type of stone, however, does not obstruct the ray sufficiently to be visualized with the screen.

The difficulty in arriving at a decision as to nephrectomy is not in those cases "where the kidney is mostly destroyed or where a large pyonephrotic sac is present or where the remaining kidney tissue is highly inflam-

ed," but in those cases where stones recur after removal from comparatively good kidneys. Most of us must have had the unpleasant experience, after successfully removing a stone from the kidney, of having the patient return in a short time with a recurrence of symptoms or of hearing that the case had gone elsewhere for further advice. This has been my own experience in two cases, and I have had the care of similiar cases previously operated on by the most competent surgeons.

I have at the present time under my care a young man who had a stone removed from the right kidney in 1916. In 1919 another was removed. Both operations were done by surgeons of note. He now has symptoms of recurrence of stone, and the *x*-ray shows a shadow in the right kidney area. He has also passed stones. Pus is constantly present in the urine. The left kidney has always been normal.

I think this is a case in which nephrectomy should be advised.

Two points, however, must be considered, the possibility of bilateral stone, and the recurrence of stone in the remaining kidney. Rovsing,[1] in his series of 533 cases of renal stone, found bilateral stone in 58, or a little over one in every ten patients, while Braasch[2] found stone to be bilateral once in every six cases. Cases are recorded where after nephrectomy stone has promptly formed on the opposite side.

These cases of recurrent stone require, and in fact every case of urinary stone requires, most careful preoperative and postoperative treatment. The free use of distilled or rain water, or the waters from certain springs that do not contain lime salt, as advocated by Ochsner and also by Rovsing, can do no harm, and may do a great deal of good. We have no scientific proof that distilled water, more than any other whole-

some drinking water, such as is supplied to all modern cities and towns, lessens the tendency to stone formation, or the recurrence of stone, and the clinical evidence is not convicing. Personally I cannot get away from the germ theory as the causative factor in urinary stone. Absence of pus does not necessarily mean the absence of infection.

Morris makes a distinct difference between primary and secondary calculi, and says that the latter "occur in kidneys which have been the seat of previous disease whereby lime salts are precipitated from the urine as the result of chemical changes caused by the presence of microörganisms in the kidneys; they are the secondary effects of septic processes within the pelvis and calyces of the kidney.

Chas. H. Mayo[3] reminds us that the shells of the crustacea are formed, not by the mollusks themselves, but by the bacteria that inhabit the water in which they grow, and says that Turnbull has pointed out that a change in environment,—that is, a change from the English coast to the Mediterranean coast,—changes the form which the shell assumes. It is fairly well recognized that the incrustations on the teeth and that gall-stones are due to the action of bacteria. The taking of large quantities of drinking water may so change the environment that the bacteria do not develop, or hastens them along the urinary channels through which they are normally eliminated from the body before any evil can be done. Stagnant pools of water always favor the growth of germ life.

Changing the reaction of the urine, if highly acid, by large doses of potassium citrate or, if alkaline, by acid sodium phosphate combined with urotropin, or by an intensive treatment alternating from one to the other from time to time, is of decided benefit. The use of an autogenous vaccine, apparently in some cases, has

given good results. Focal infections have been blamed for almost every disease under the sun, and should not be lost sight of in this condition.

Crowell and Thompson[4] have recently advanced a treatment for the prevention of recurrent stone, following nephrolithotomy which promises good results. It consists in irrigation of the renal pelvis with 0.5 of 1 per cent silver nitrate solution twice weekly, the strength being increased and continued until infection has disappeared. Two weeks after operation treatment is again begun, and continued as long as infection persists.

In my last few cases of stone where infection was present I have adopted the following method: A rubber tube of very small caliber is inserted into the pyelotomy incision. The opening in the pelvis is closed about it with a pursestring suture or a few Lembert stitches of fine catgut, one stitch anchoring the tube in place. The distal end of the tube is secured to the skin with a stitch of silkworm-gut. Care should be taken that there is no tension on the tube between the inner and outer stitches lest the end of the tube become displaced from the opening in the renal pelvis. If a nephrolithotomy is done, the tube can be inserted through the incision in the kidney tissue. Through this tube two or three drachms of a 10 per cent solution of argyrol are instilled into the pelvis of the kidney daily, until infection has cleared. If the ureter has proved to be free from stricture before operation, I do not believe there is any danger of fistula following this procedure. The results so far have been good, but the cases are too few and too recent from which to arrive at any definite conclusions.

W. J. Mayo,[5] in a review of 450 operations for renal stone, states that nephrectomy was done in 204, usually for pyonephrosis complicating stone, and also states

that the condition found at the second operation showed that in many cases nephrectomy should have been the primary operation.

In Rovsing's[1] series of 533 cases, with 295 operations, there were 55 nephrectomies, or 18.6 per cent. These figures show the necessity for earlier diagnosis, and more thorough pre-operative and postoperative treatment.

When, however, conservative measures have proved to be futile the patient's interests are best served by a secondary nephrectomy.

The following points should be emphasized:

1. As the question of primary nephrectomy may arise during an operation for stone after the kidney is exposed, an *x*-ray of both kidneys, both ureters, and bladder should be taken in every case. Catheterization of both ureters should be done to eliminate ureteral stone or stricture. A functional renal estimate of each kidney should be made. A blood, urea, and creatinin test should also be made if the urea elimination is below normal or the functional test shows any degree of renal insufficiency.

2. These same precautions should be taken when secondary nephrectomy is under consideration, and should the opposite kidney show any sign of stone or disease, or its function be markedly impaired, nephrectomy should not be done if the first kidney is eliminating urea. It should be mentioned that the function of the opposite kidney may be reflexly suppressed, and when this has fully recovered after removal of stone from the first kidney nephrectomy could then be considered.

3. The strains and types of infection present in renal stone call for further study and investigation, be-

cause from this knowledge may be evolved a line of treatment for the prevention of recurrent stone.

4. More thorough pre-operative and postoperative treatment of these cases will reduce to a minimum the necessity for secondary nephrectomy.

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DISCUSSION

Dr. H. B. Sweetser (Minneapolis, Minn.): I think the essayist has taken a very sane position on this question, and I was very glad to hear him say that we should not be too quick in deciding on a primary nephrectomy when operating for stone. The opposite kidney may have its function temporarily suspended because of the operation, and, until this resumes its function, even a small amount of normal kidney tissue in the diseased kidney may be essential to tide the patient over this intervening time. For this reason I believe a secondary nephrectomy is decidedly the wisest procedure in the vast majority of cases. Unless the infection is very grave, it is difficult to see how anything but good can come from such delay.

Dr. Byron B. Davis (Omaha, Neb.): I have been very much pleased to have this subject brought before the Association. I want especially to commend Dr. Maclean for recommending such a thorough investigation of both kidneys before the operation.

In any case where there is a possibility that a nephrectomy may be done, I think that is the case that needs the most careful pre-operative study. We should know absolutely what that other kidney is doing before we think of

doing a nephrectomy. I have been impressed in the past by the wonderfull recuperative power the kidney possesses.

I had the experience of having a number of traumatized kidneys where I removed the shreds of half the kidney; and the remains of the kidney performed the duties of the whole kidney. In operations for stone, I feel very conservative about doing a nephrectomy, and would especially back up what was said by Dr. Sweetser, that by waiting the other kidney has taken on the secretion and increased its activity. At the same time I have had the experience of wishing I had done a primary nephrectomy, and I think it is better to have regrets in that direction than to remove a kidney which might have been saved.

In the main, I believe, considering what a very important organ the kidney is, we should be rather conservative about taking out the kidney if it seems to have any amount of secreting area left.

Dr. Herman E. Pearse (Kansas City, Mo.): There seems to have been some reason in the development of the human body—something that must be called for by the organism on account of its environment to produce such a development of renal structure that one-third of one kidney will carry on the function for the body. There must be very frequent assaults made on the renal system that take place during the apparently normal phases of life. It is well known that one-third of one kidney will maintain life if called upon to maintain its maximum activity.

The question of whether we are going to cut out the kidney or leave it, brings up the question of the drainage of that kidney. It seems to me, if any thing has been worked out in the last few years, it has been that we must attend to the drainage of that kidney by its ureter. The careful pre-operative study seems now by the genito-urinary men to be made in vertical position. They inject the kidney, photograph it with the patient standing, and, through the fluoroscope, watch for things over the course of the ureter that interfere with the drainage.

Dr. A. E. Benjamin (Minneapolis, Minn.): I am interested in infection of the kidney and drainage. This septic condition may be often overcome by putting a tube into the kidney and washing it out with argyrol. In addition to that, we should be sure that the ureter is not blocked. Occasionally we

find that a stone has damaged the ureter so that there is some stricture, and the kidney will not function perfectly. As Dr. Pearse has stated, we must see that these kidneys drain well, that they are on as high a level as possible when operated on, and plenty of fat put around the ureter and below the kidney to push it up so that it will become fixed high up which will favor drainage.

Dr. Maclean (closing): I was particularly interested in listening to the discussions of my paper, and am glad it brought out a few points.

Dr. Sweetser spoke about these cases of colic where no stone is found at operation, and I have been wondering if you can get this severe colic without stone, and if there is not usually a stone that has been overlooked. In my own case I think that the stone must have been there when I operated.

Albaran says that in every case of renal stone there is also stone nephritis. I suppose it is true to a certain degree, but I have seen the pathological report where there was a stone, and no evidence of nephritis could be found.

I was also glad to hear that Dr. Sweetser had operated so many times on one case, because we very often have to do this. We are, however, very much tempted to do a complete operation and make sure the trouble is not going to occur again.

Dr. Davis brought out the point of a very thorough investigation before the operation, and the reason I mentioned that case was because, at first sight, I did not think a nephrectomy would have to be done at all.

Dr. Pearse brought out the point of drainage of the ureter, which is important and which I mentioned. Dr. Benjamin brought out the point of putting a tube in the kidney. The tube I use is not put in as a drainage tube, but is a very small one, put in for the purpose of injecting the argyrol solution thus saving the patient the discomfort of having a cystoscope passed and the solution injected into the pelvis of the kidney through a ureteral catheter.

EPIDERMOID CYSTS

H. H. Sherk, M. D., F. A. C. S.

PASADENA, CALIFORNIA

The subject of this paper is not important from the standpoint of the seriousness of the condition, but of interest because, as a pathological entity, it is very seldom recognized and, to the majority of operators, entirely unknown. A number of surgeons were recently asked as to the frequency of epidermoids in their practice. All either pleaded ignorance as to the nature of these cysts or had them confused with true dermoids or sebaceous cysts.

Some fourteen years ago the difficulty of arriving at a post-operative diagnosis of a growth, which was thought before excision to be a possible skin sarcoma, first drew the writer's attention to these cysts as differentiated from follicular, retention, or sebaceous cysts. The observance of several other cases, in the course of a few years, led him to report them to the Clinical and Pathological Society of Los Angeles, none of whose members had ever seen any of these growths.

Since then Dr. Black has been on the lookout for these cysts in the material referred to him by others for examination. Nevertheless, until the recent requirement of some of our hospitals, that all tissues removed at operations must be examined by a pathologist, none had passed through his hands. But within the last year he has had four cases occurring in the practice of four different surgeons; and during the same period the writer has operated on five patients presenting this form of tumor. Evidently these cysts are of frequent occurrence, but are mostly unrecognized because unexamined pathologically.

The literature on epidermoids until recent years

was rather scant. Garre, in 1894, comments on the rarity of anything on the subject.

The term "epidermoid cyst" has been variously used by writers to describe cysts occurring in at least three widely different localities—the pelvis, the brain, and the external surface of the body. The pelvic epidermoids of embryonic origin and those of the third ventricle[14, 15], resulting from an inclusion of the craniopharyngeal duct, will not be considered in this paper. These latter cysts, however, are of extreme interest and importance from their relation to tumors of the hypophysis and hyper and hypo-pituitism. Only cysts of the body surface will be discussed.

These surface cysts, as such, were first described by Garre[13] under the name of "traumatic epithelial cysts." They have been variously termed by others as *atheromata, inclusion cysts, implantation cysts* (Sutton), and finally by Franke as *epidermoids*. The last name best defines their histological characteristics and is undoubtedly the most acceptable designation.

The various writers have held mainly to two opinions as to the etiology of these cysts, traumatic and congenital. There are perfectly good grounds that either theory is right in certain cases. Some are undoubtedly traumatic in origin, and many others as certainly congenital.

Franke[1] was the first to discard the old doctrine of the sebaceous gland origin of atheromata. He[3] thought they were fetal inclusion cysts.

Then Torrok[1] further confirmed the new theory of the embryonic ensnaring of atheroma germs by a detailed histological investigation of the walls and contents of these cysts.

Unna[1] agrees with Torrok that true atheromata are a sort of simple dermoid and are developed from embryonic aberrant germs.

Gros and Reverdin[8] were the first to suggest the traumatic mode of origin.

Bland-Sutton[11] thinks they are traumatic in origin and calls them implantation cysts.

Pels Leusden[2] believes that they have their origin in superficial tuberculous lesions; and that, following suppuration, the epithelium turns inward and, creeping along the fistula, lines the whole cavity.

Csillag[12] speaks of cysts following vesicular skin diseases and in scars resulting from injuries and quotes Kaposi, Neisser, Petrinni, Crocker, Vidal, Hallapeau, Duhring, and others. Warner[8] reports a case occurring in a herpetic scar.

Blumberg[2] claims that all are cholesteatoma or pearl cysts.

Franke[2] thinks only a small part result from traumatism and that many of these are due to trauma without injury to the external surface. The latter opinion is hard to understand.

Cederbaum[4] quotes various authors as to the theories of origin and believes that only a small percentage of epidermoids are caused by traumatism.

Woerz[3] reviews 55 cases, 14 of which gave distinct history of traumatism, mostly, after punctured wounds, one after a hammer blow, three following panaritium.

Pietzner[8] collected 73 cases, 43 having a history of trauma, including dog bite, hammer blow, incised wounds, penetration with pieces of wood, and punctured and contused wounds.

The theory of traumatic[3] origin is strengthened by the experimental observations of Kaufman,[4] Masse[4], Ribbert,[4] Manasse, and Schweninger[2], that detached

pieces of surface epithelium, transplanted under the skin or fascia and in tendons, would proliferate and form small cysts.

Franke[2] notes the absence of ducts or external openings in epidermoids as against their being retention cysts. The presence of papillae with the absence of sebaceous cells was noted by Torrok[1].

A brief reference to the anatomy of the skin will aid in an understanding of the origin and the differentiation of these cysts from other cysts of the body surface.

The skin consists principally of a layer of vascular tissue named the derma, corium, or cutis vera. External to this is a layer or covering of epithelium termed the epidermis, cuticle or scarf skin. Under the derma, or true skin, is the subcutaneous cellular layer containing the skin appendages, namely, the hair follicles, sweat glands, and sebaceous glands.

The epidermis is an epithelial structure belonging to the class of stratified squamous epithelium, arranged in four strata, namely, from within outwards, rete malpighii, stratum granulosum, stratum lucidum and stratum corneum.

The most superficial stratum of these cells, called the stratum corneum, is composed of many layers of horny epithelial scales.

It is these horny scales that, when desquamated, form the principal content of the epidermoid cyst, and the four strata of the epiderm are found in reversed position in its walls.

Only the elements of the epiderm are found in the walls and contents of these epidermoids. The dermoids, however, contain the elements of both the corium and the epidermis, as well as those of the skin appendages, hair, teeth, sweat glands, and sebaceous glands.

The sebaceous cysts are follicular or retention cysts and show the histologic elements and secretion of the sebaceous glands or their ducts.

Unna[1] describes the atheromata or epidermoids clinically as "subcutaneous, indolent tumors, varying in size from that of a pea to a walnut, which distend the skin hemispherically, show no opening, and contain gritty, glistening, odorless dèbris of horny cells, mostly occurring in the hairy scalp, often multiple, slow growing, lasting for years, and showing periods of growth and arrest alternately." He further says, "Histologically they are defined as an epithelial collection cornified in the center and lying in the hyperderm, which is margined from the surrounding tissue by a firm or delicate connective tissue capsule and which gradually by its pressure leads to atrophy of the adjacent tissues or their constituents."

Epidermoids[4] of traumatic origin grow more slowly and are less in size than the congenital, as embryonal cells have a greater ability to grow.

Pietzner[3] found the period of time elapsing between the causative trauma and cyst development to vary from one month to twenty-four years.

Unna[1] notes the absence of microörganisms in epidermoids and states that the typical content of the epidermoids consists of concentrically arranged horny layers, plates of cholesterin, and dèbris of both constituents with frequent fragments of lime and pigment.

Torrok[1] found by osmic acid tests, the absence of sebaceous cells, and, almost invariably, of fats generally.

Ether[5] will not dissolve the material contained in epidermoids.

According to Buerger[3] desquamated horny epithelial cells, granular detritus, and at times cholesterin

crystals fill the interior of these cysts. He says, "In short we have the usual elements of the epiderm surrounded with connective tissue, but arranged in inverse order so that the stratum corneum is innermost and furnishes the material for the cyst content."

The walls of these cysts show some or all of the elements of the epiderm,[3] and are made up from without inward first of a layer of connective tissue, then of cuboidal and polygonal epithelial cells, which become gradually flattened in the succeeding layers, until finally the innermost stratum shows only cornified epithelium.

The presence of giant cells in the cyst wall is ascribed by Stewart[7] and Cederbaum[4] to irritation by the desquamated cell content. Other writers, notably Hildebrand[7] and Williamson, have claimed they were due to the presence of hairs. The cells are of the foreign body type and are only found in the granulation tissue like layer which lines such portion of the cyst wall not made up of epiderm.

Different parts of the body are given by various authors as the most common site of epidermoids.

Bland-Sutton found them most frequently on the hands and fingers, and is agreed with in this by most of those who hold to the traumatic origin of these cysts.

Pietzner[3] found that 63 out of 73 occurred on the hands.

Unna thinks they are most frequent in the hairy scalp.

Dubreiuth reports thirteen collected cases, following various kinds of trauma including surgical operations, on parts of the body other than the hands and fingers; the forehead, tongue, buttock, penis (congenital and

following circumcision) and toes (following operation for ingrowing toe-nail).

In the author's eleven cases and four observed by Black, the cysts were found in the following positions: scalp, 4; back 2; one each on shoulder, arm, cheek, lower jaw, neck, breast, groin, buttock, and finger.

In two cases there were multiple cysts; the remainder were single.

Buerger[3] found most in men, Woerz[3] reports only 7 out of 53 in women. Pietzner[3] in 73 cases—63 male and 10 female.

In the author's eleven cases, five were men, six women. Black's four cases, 2 men, 2 women.

Epidermoid cysts are differentiated from sebaceous cysts by the absence of an opening and by the difference in contents. All sebaceous cysts show an opening in the skin and, without being pricked, discharge their contents from time to time, or may have their contents expressed and their shape changed or moulded by external manipulation.

The absence of all microörganisms separates epidermoids together with dermoids from follicular cysts. Unna[1] lays much weight on this fact as a means of differentiation in certain large atheromatous like follicular cysts. Closed or open cysts that have contents fatty or smelling of fatty acids are never epidermoids.

The pearly luster of the contents in epidermoids is one of their most noticeable and constant characteristics. Almost as constant is their laminated and flake like appearance.

No attempt has been made to collect or tabulate the reports of cases from the literature. Various

authors, in their papers, have duplicated the cases and several, Bland-Sutton[10], Pilliet[9], Dubreiuth[6], Little[5], Buerger[3], Warner[8], Cederbaum[4] and others have reported cases of their own, some of which were diagnosed and others mistaken for other forms of growth until excised.

The writer has operated on eleven cases of epidermoid cysts.

These cysts varied in size from one-half inch in diameter to 1¾ by 1 inch in size. All except the three of traumatic origin had existed for years, or, as the patients said, "as long as they remembered."

The traumatic cysts were operated on, 1, 1½ and 14 years, respectively, after the occurrence of the trauma. The inducing traumata were a splinter driven into the skin, hat pin puncture, and a blow on groin.

The cysts have always shown as nodules, more or less hemispherical projecting from the body surface, a few unattached to, but the majority firmly fixed to and a part of the skin, but freely movable as to the underlying tissues. The overlying skin, with few exceptions, has been firmly attached to the cyst for a considerable portion of its external surface. They were not flattened, as are sebaceous cysts, and, unlike the latter, could not be moulded or changed as to shape.

None had any external opening or duct, nor could any of their contents be expressed. One case had a small sebaceous cyst in the overlying skin, and the odorous sebaceous material expressed from it led to an incorrect pre-operative diagnosis of the main cyst, whose contents proved entirely different.

The majority of these cysts showed enlarged and dilated capillaries in the skin overlying the summit of

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the nodules. One of them showed this over the whole external surface of the tumor, and the overlying skin was more pigmented than the surrounding surface.

Two of the traumatic cases (splinter and hat pin) were infected, showing inflammation and suppuration at the time of excision. The contents of none were odorous, as in most sebaceous cysts.

The contents varied in the different cysts as to consistency and color. Some were softer and some darker than others, but all showed the granular, scaly and more or less laminated horny appearance, more or less markedly pearly and glistening in spots. Some of the harder and dryer contents were decidedly laminated in nature and separated into scaly flakes, occasionally quite large in size.

The cyst walls were rather thick and firm in most of the cases, the inner surfaces pearly white, and some were so typical as to contents that a macroscopic diagnosis could be made, but others were only settled with the aid of the microscope. However, the final diagnosis was made by histological examination in every case.

Giant cells were found in only two or three instances and were distinctly of the foreign body type.

The following is a list of the author's cases.

Case 1.—Miss E. B., aged 20. Tumor the size of a hickory nut on the posterior surface of the left shoulder, over upper border of scapula, present since early childhood; hard, firm, and intimately attached to skin. There were many distinctly dilated capillaries over apex of nodule.

Pre-operative diagnosis: possible sarcoma of the skin.

Case 2.—Miss M. B., sister of the patient in Case 1. Small hemispherical nodule on outer posterior aspect of left arm about two inches above elbow. Present as far back as patient

could remember. Excised to see if of the same nature as cyst in Case 1. Proved to be the same.

Case 3.—C. D., a boy, aged 14. Small hard nodule over left side of lower jaw. Freely moveable. No history of trauma.

Case 4.—L. M., man aged about 40, had six cysts on back between neck and buttocks. One other had previously been excised by another operator and called sebaceous. The six cysts ranged in size from one-half to one inch in diameter. Two of these cysts had markedly dilated capillaries present on the surface. All six were epidermoids and it is possible the seventh one was also epidermoid in nature.

Case 5.—F. K., boy, aged 12, had single cysts one-half by three-fourths inch on left cheek in parotid region, considered as a possible endothelioma before excision. No history of trauma.

Case 6.—P. H. S., man, aged 50, had single cyst on scalp with thick but fragile walls. Had existed for more than six years. Pea-sized and movable when first seen, grew slowly. No history of trauma.

Case 7.—J. F. H., man, aged 62, had single cyst near nipple of left breast at site of splinter penetration two years before. One year later a lump appeared. Operated on two weeks after extrusion of piece of splinter associated with suppuration. The cyst was about three-fourths inch in diameter, apparently in the skin, quite close to the nipple, but could not be definitely connected with the mammary gland. The whole breast was excised for fear of possible malignancy.

Case 8.—E. D., woman, aged 60, had single cyst mass involving skin of left groin well up towards anterior-superior spine of ilium. It was the size of a small hen's egg, slightly irregular in shape, had many enlarged capillaries on its surface, and was somewhat pigmented. Contents distinctly yellowish in spots from cholesterin crystals. Had been present for over ten years, appearing soon after accidental trauma, was opened and swabbed out some years after its first appearance. Grew slowly and finally became sensitive to pressure of corset.

Case 9.—N. H., woman, aged 22, had single cyst on back to left of midline, lower dorsal region. Had been present for years. No enlarged capillaries on surface; supposed to be sebaceous cyst, but proved to be an epidermoid on excision.

Case 10.—G. H., woman, aged 42, had single cyst of scalp three-fourths inch in diameter, noticed seven months prior to operation, following trauma by hat-pin, which had occurred three or four months before the appearance of the tumor. Was inflamed and suppurating at the time of operation, and the cyst-wall was firmly adherent to surrounding tissue and came out piecemeal. Contents were laminated and horny. It was microscopically an epidermoid.

Case 11.—J. R., woman, aged 57, had three cysts on scalp one-half to three-fourths inch in diameter. Had had three others, one of which suppurated and discharged, the other two were removed by another operator and called sebaceous cysts. Of the three remaining cysts, two had been inflamed before and were very adherent, the third shelled out easily. All three were epidermoids, and it is most probable that the other three were also of the same nature.

The four cases observed by Dr. Black were as follows:

1. Case of Dr. C. G. Toland. Woman, aged 50. Crushing trauma of finger, one year before operation. No bleeding at time of injury, but intermittent swelling, with recent appearance of white spot, associated with pain. Cyst removed showed characteristics of epidermoid.

2. Case of Dr. L. B. Morton. Male, aged 30, had cyst of gluteal region the size of a small orange. No history of trauma. Present 9 years. Excised after two years, but reappeared. Second excision by Dr. Morton with no return.

3. Case of Dr. J. H. Forbes. Woman, aged 58, had cyst one and one-half inches in diameter on scalp to side of occiput, above neck. No history of trauma.

4. Case of Dr. Paul Ferrier. Male, aged 50, had cyst on back of neck to left of spine, size of lemon. Not supposed to be traumatic. Had existed over two years. Was inflamed and had been lanced once. Contents foul-odored, laminated, and pearly.

SUMMARY

Epidermoids are evidently of fairly frequent occurrence, but almost invariably unrecognized.

They are almost always mistaken for sebaceous cysts.

They may be either traumatic or embryonic in origin.

The pearly, horny, and laminated contents make their recognition easy.

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DISCUSSION

Dr. Stanley P. Black (Pasadena, Calif.): In corresponding with Professor Welch in regard to this question, he says that he does not use the term "epidermoid," but classes them as "dermoid." In a recent review of cases that were termed sebaceous cysts, they proved to be dermoids or epidermoids. They are interesting because seldom recognized or confused with sebaceous cysts. Some that I have seen would have passed ordinarily for sebaceous cysts had they not been examined or the contents of the cyst been shown. Ordinarily a sebaceous cyst is thrown aside and no attention paid to it.

As to the question of their being malignant: They are never malignant, but it is possible that carcinoma may be implanted on them. Most of those occur early in life.

Dr William T. Coughlin (St. Louis, Mo.): The first case of cyst I ever saw involving the finger I diagnosed as cancer and ordered the finger amputated. I removed the cyst and

left the finger. A small splinter had been in the finger three or four years, the patient having recalled that he stuck something into his finger. It had a very thick wall, and there was epithelium found inside of it.

The name *epidermoid* gives one the idea that it is a cyst something like epidermis. I do not know anything about the cysts that are non-traumatic. The kind of cyst that I am thinking about when the essayist says "epidermoid cyst" is the implantation cyst that follows a traumatic condition where epidermis is carried in. I suppose some of the epidermoid scales are looser and are left in the tissue as the foreign body is withdrawn.

Dr. Sherk (closing): The first one was looked into as it was considered serious at the time and I thought it was a sarcoma. In thinking back over cases I have had I am sure there are three or four others of the same nature. I removed from the temple of a doctor a small cyst which, before operation, we thought was sebaceous. We followed it deep into the bone, and I thought I was never going to get to the end of the cyst.

It evidently was a fetal inclusion cyst. As to the malignancy: I said nothing of that in the paper because they are never malignant. Ewing in his book speaks of epidermoid carcinoma, but he separates that entirely from what he calls epidermoid or implantation cyst. A number of cases have been reported in which foreign bodies have been found, embedded in the cyst contents, a broken needle, splinters and so forth.

A NEW ADVANCED SURGICAL TREATMENT FOR BREAST CANCER

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Within the year the statement has been published that the limit of surgical technic in carcinoma of the breast has been reached, and that because of this nothing further could be hoped for in the way of improvement in the statistics of breast operations for cancer. In this paper I want to add six new and additional steps to the technic of breast operations, that will, I am sure, improve very materially the present-day statistics of this operation.

First: The use only of the hot knife in the removal of breast carcinoma, including a complete dissection of the axilla.

Second: That in the advanced type of case no attempt be made to preserve or secure skin flaps.

Third: That the skin around the denuded area (left without flaps when the breast and axillary glands are removed) should be undermined from two to four inches with the hot knife.

Fourth: In the after-treatment, besides the use of Dakin's solution, that the arm on the operated side be maintained in an elevated position with the forearm resting on the top of the head, until practically the surface denuded by the hot knife is entirely covered with new skin.

Fifth: That vigorous daily massage and forcible movement of the skin and arm adjacent to the denuded area be instituted as soon as granulations have commenced to appear.

Sixth: The only carcinoma of the breast considered inoperable by the heat technic is the one where inaccessible metastasis has developed.

Fig. 1. Incision is first lightly outlined on the skin with cautery tip and then started by thrusting it through the elevated skin into subcutaneous fat and continued by following the outline. Always cut from within outward with the cautery knife. A less extensive excision may be considered desirable with the formation of flaps which permit of closure in early cases and where the growth is small and movable. Note relation of incision to cephalic vein.

The balance of this paper will be devoted to the discussion of these six propositions.

Rodman in his book on "Cancer of the Breast" makes the statement that if the cases are seen early

the modern operation with the cold steel knife, in trained hands, should give a fifty percentage immunity from return, local or general, for a period of five years or over. My experience, however, based on my own work, would indicate that these statistics are possibly misleading in that they are too favorable as to recurrences. I see a rather large number of recurring breast carcinomas, which come with the hope by the patients that their second operation may be successful if done with the cautery knife.

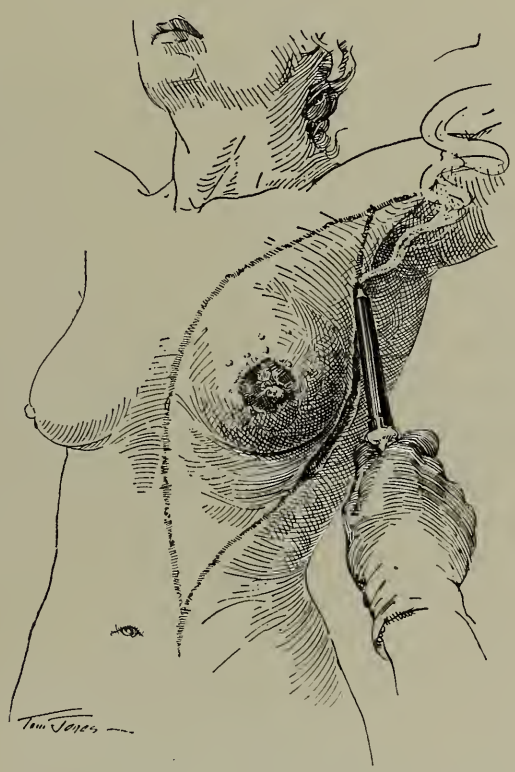

Fig. 2. Showing incision with cautery knife cutting from within outward.

It is not necessary to discuss the need for improving our operative results in the treatment of cancer, breast or otherwise. The efforts made by surgeons in the past to prevent local recurrences following operations for this disease, are a most fascinating chapter in the progress of the surgical art. The outstanding thing

has been the constantly increasing endeavor to cut wide of the disease.

It is no part of this paper to dwell on the question of diagnosis, except to urge that an *x*-ray of the thorax be taken in every case. This is especially important if

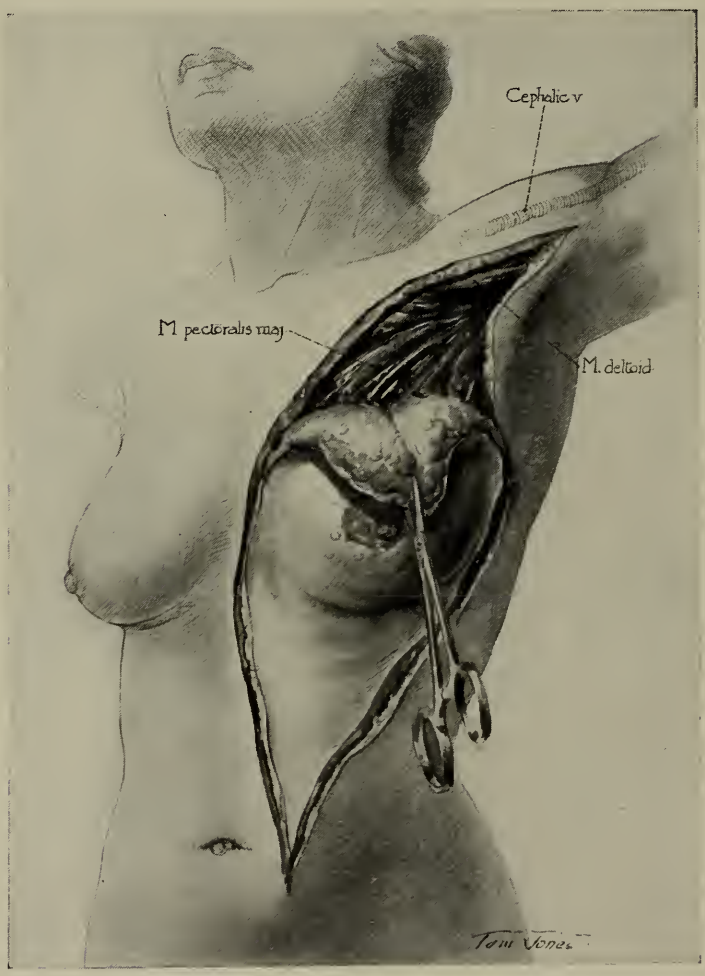

Fig. 3. Incision of the skin completed. The cautery knife is made to loosen up and infiltrate with heat the structures between the fascia and skin from two to four inches all around the primary incision. Care should be taken to preserve the cephalic vein between the pectoralis major and deltoid muscles.

the breast is fixed to the chest wall. But I want to emphasize here that fixation alone is no contra-indication with reference to the possibility of obtaining a suc-

cessful result by a cautery knife dissection and amputation of the breast.

If the cancer in its progress has not already upset vital physiological functions in the patient to a degree

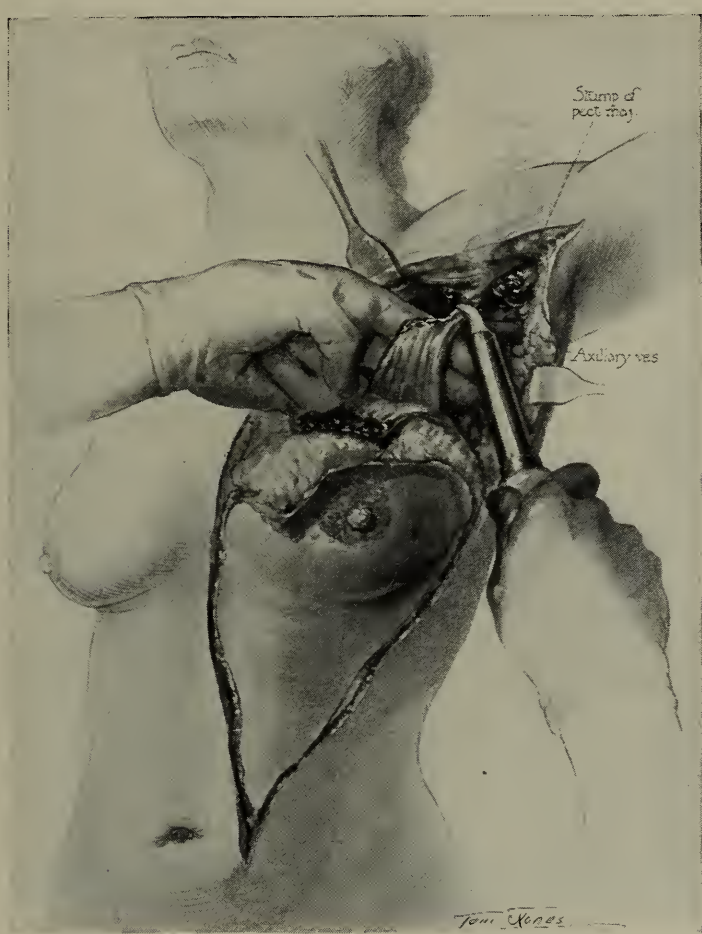

Fig. 4. Dividing the pectoralis major. Exposure of the axilla with the cautery is no different than other surgical methods in this region except that the hot knife is used throughout. It is important in dissecting the axilla to keep the fingers of the free hand near the cautery tip. In this way one lessens the danger of getting careless in overapplying the heat to the blood vessels and brachial plexus.

to make any treatment palpably hopeless she should be given the benefit of a cautery knife surgery, regardless of how extensive the primary mass of cancer itself has become.

The condition of the inoperable case of cancer is so desperate that its consideration from the standpoint of treatment places it outside the realm where ordinary

Fig. 5. Removal of the axillary gland-bearing fascia. The small vessels running into this mass are severed with the cautery knife and ligated with No. 1 catgut. After this dissection the entire breast is removed with the cautery from the chest wall by separating the pectoral muscles and skin from the ribs. Any pathologically infiltrated or adherent areas are gone over again and are thoroughly heated after the removal of the gross mass. The heating iron is also passed slowly over the intercostal muscles.

surgical judgment can rule or guide us. It is in this class of cases that the cautery knife often gives the most beneficent results. The outstanding fact regarding cancer everywhere in the body is its vicious tend-

ency to easy dissemination. Were it not for this supreme fact the cancer question would be robbed of its chief importance. Scalpel surgery does nothing to circumvent this easy characteristic of the disease. This

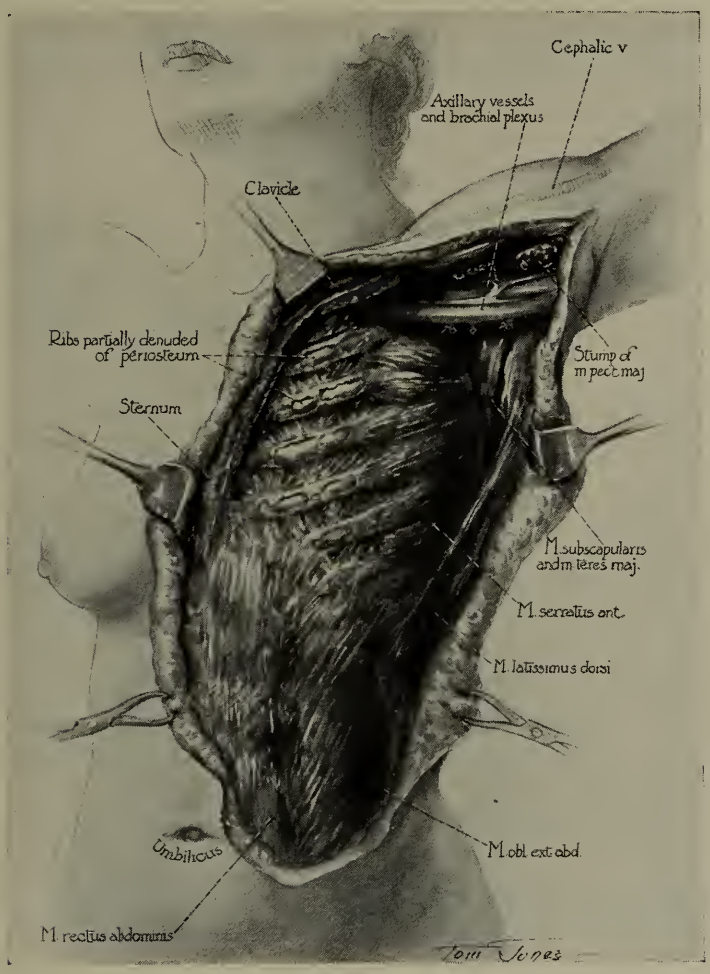

Fig. 6. The completed dissection. This is done with the cautery knife only. The edges of the wound are extensively moblized, the brachial plexus and axillary vessels are dissected free with the hot knife leaving them absolutely clean and cancer free. The heat is thoroughly spilled into the apex of the axilla and also over the fascial coverings of the rectus muscle down to and including the umbilical region. A temperature sufficient to melt fat is usually all that is required in these regions. As a last procedure the cautery shank is slowly passed over the intercostal muscles. This accounts for some of the destruction of the rib periosteum shown in the illustration.

applies practically as far as cold surgery is concerned to the early as well as to the late case.

The unheated knife does not devitalize any of the malignancy it does not remove; the hot knife does. The cold knife does not spoil the soil for the further development of cancer; the hot knife does. The knife unfortified with heat, if it touches cancer, vaccinates it into new areas; the hot knife does not. The cold knife stimulates the growth of the unremoved cancer cells; with the hot knife this is impossible.

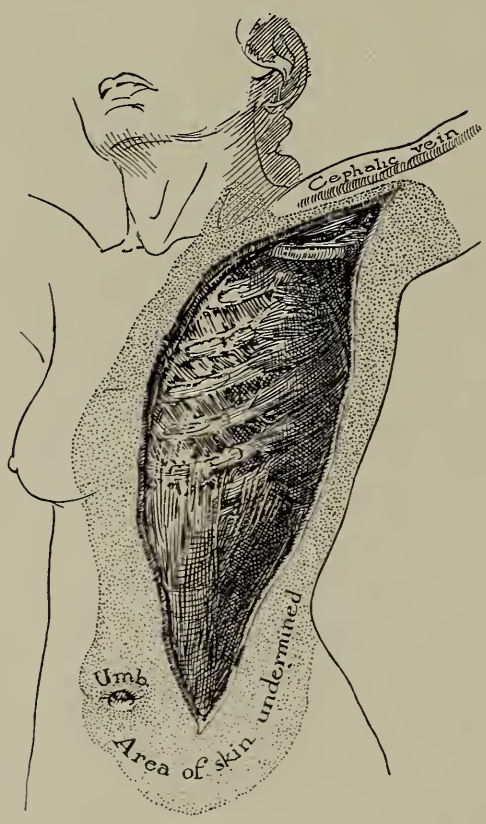

Fig. 7. Diagram showing approximate extent of undermining of skin for the dissemination of heat.

The too frequent recurrence of cancer after the use of the cold knife, especially in the field of operation, has disheartened both the public and the profession as to the ability of surgeons to do much that is worth while to circumvent it.

The actual technic of the use of the hot knife in cancer has for its main purpose the wide removal of

the proximate lymphatics with their load of malignant cells, and the destruction of the distant ones by the dissemination of the heat as far as it is possible to make it go through the apparently uninvolved tissues. With this technic it is necessary to distinguish two degrees of development in the growth of breast cancer, that is, the early and the late, and to apply the method suited to the individual case.

The early type of growth is characterized by the small mass which is adherent to neither the skin nor the thoracic wall, and in which there are no definitely enlarged axillary glands.

The advanced breast carcinoma is one where the mass is large, usually breaking down and adherent to the skin or chest wall, or both , and in which the axilla may show any degree of involvement from small glands to large secondary tumors. In the first or early type the operation is less radical only in that the removal of the skin with the gland is not so extensive. But, as in the advanced type of operation, the line of the skin incision is always well away from the breast, indeed, on the basis of safety we are really never justified not only in not using any of the skin over or near the tumor, but also in retaining any of the skin for the purpose of flaps over the gland itself. If, however,the surgeon is willing to risk retaining some of this overlying breast tissue it should be dissected free from the gland with the knife cautery in such a way that the skin flap retains none of the gland tissue. More than this: These skin flaps should be infiltrated with the heat to a degree certain to make them also free of viable cancer cells. The reason for this is that the breast glandular tissue comes very close to the cutaneous structures, and when it is known that some part of its structure harbors cancer cells its limits should not be left to chance.

In the second, or advanced, type the line of the skin incision and excision with the hot knife extends a half inch below the cephalic vein on the upper and front part of the shoulder, inward above the axilla, continuing toward the sternum about an inch below the clavicle. From the junction of the inner third with the

Fig. 8. The completed operation. The skin edges are hooked on to No. 14 copper wire (English standard), protected at intervals by sections of split rubber tubing. The arm is kept constantly over the head except when the wound is dressed. A rubber dam drain is placed below and at the back. The first dressing is made in three or four days and narrow rubber tissue strips are then applied across the wound at inch intervals. Dakin's or eusol solution is applied after the first dressing until granulations appear, then dichloramine-T is substituted. The arm is maintained in the position indicated by a "clove-hitch" and fastened around the opposite shoulder by a rather ample or thick gauze bandage.

outer two-thirds of the clavicle the incision extends downward near the costosternal margin to within two or three inches of the umbilicus. From this point the incision is made to extend outwards and upwards along the costal margin to the posterior axillary line and back to the starting point. It should be stated that this incision is first outlined with the tip of the cautery knife on the iodine covered skin. After this the hot knife is thrust under the skin and is made to open this line completely from the neck to the umbilicus down to the ribs, intercostal muscles, and fascia. This at once seals the efferent lymphatics and vessels against the dissemination of the cancer cells as far as it relates to the periphery of the excised area. The dissection is then started in the axilla by exposing, first, the insertion of both pectoral muscles. These are severed with the cautery. From this point the technic is as if the scalpel were being used in place of the cautery knife. The branches of the axillary and subclavian vessels are cut with the hot knife, and then these vessel stumps are ligated with No. 1 plain catgut. The brachial plexus is well exposed in order to clear away the gland-bearing fascia under and behind it, and as well to get the cautery heat well up in the apex of the axilla. By this maneuver cancer cells that are utterly beyond any other possible surgical treatment are destroyed, and the soil for their redevelopment taken away.

The dissection with the hot knife is then carried down the chest wall removing all structures to the ribs and external intercostal muscles within the space outlined by the primary cautery incisions. The external edges of this space are then undermined with the cautery for two or three inches. This has for its only purpose, not the formation of flaps but the destruction of lymphatics and the annihilation of their potential load of malignant cells. This undermining is especially important toward the clavicle because the major chain of

its lymphatics is connected with those from the axilla. Next the dissection is carried across the sternum, especially at the second and sixth interspaces where the lymphatics dip into the chest. If this undermining of the skin is so complete as to involve the sternal border of the opposite breast, the practical results in the way of a lessened chance of recurrence will be increased. And then the hot knife should be very thoroughly and extensively passed downward over the fascia covering the upper part of the rectus muscle, toward the um-

Fig. 9. This patient had previously been treated with cancer paste. Metastasis into the skin and axilla was extensive. Absolute fixation of breast. Maximum abduction of the arm is shown. Edema of forearm and hand.

bilicus. This is the region pointed out by Handley, of England, in 1904, as one where the permeation of cancer cells was especially dangerous. He taught that a large number of malignant infections of the liver occur as the result of metastasis through the chain of lymphatics. Finally, the skin should be loosened and the fat between it and the fascial coverings of the external oblique and the latissimus dorsi, up to and

involving the scapula, melted and even made to boil. This will loosen a long strip of skin posteriorly which will drop down on to the operating table because there is nothing to hold it. It is held in place at the final dressing, however, by heavy wire hooked into the edges of the skin, on each side of the denuded space. A practical point is not to permit the hot fat to run down over the normal skin, as it produces an annoying superficial burn.

I wish to emphasize here that the only instrument used in this completed operation is my electric cautery knife. An occasional hemostat may be required. This is not used the second time until it is resterilized; neither is there gauze dissection in any part of the field. If gauze sponges are required, and this is rather rare except to mop up the melted fat, they are allowed to touch the operated surface but once, when they are discarded. The operator's rubber gloved hands are frequently dipped in a weak solution of iodine.

The two remaining steps of the technic that are new refer to the post-operative care of the patient. If the arm on the operated side is kept closely approximated to the side of the head and the forearm turned over the top of the head and fastened there, the patient will obtain the maximum of comfort. I have experimented with many different forms of apparatus and methods to maintain this position of the arm, but have found none so satisfactory or efficient as the simple placing of a clove-hitch around the wrist and tying the other end of the bandage around the opposite shoulder. As far as I know, this position is original with this operation. It has many things to commend it:

First, it is more comfortable than when the forearm is placed upon the chest, and the arm rigidly bound to the side of the thorax.

Second, most important, it requires the natural reparative powers of the body to supply a sufficient amount of new skin to permit of the final maximum normal movements of the arm. It is comparatively easy to get the arm down after being in this position,

Fig. 10. Same patient as in Figure 9. Arm overhead. Cautery dissection extending into opposite breast. The sternum, scapula, latissimus dorsi, upper half of external oblique, axillary vessels, and brachial plexus are all exposed. The ribs are practically denuded of periosteum. Absolute mobility of all structures forming the whole extent of the wound. This picture was taken at the time of the first dressing, four days after the operation. No pain or increase of temperature at any time.

if necessary for weeks or months; but it is almost impossible, as we all know, to get it up if the healing process has occurred while the arm was down.

Third, the chances for the development of a lymphangitis and edema from cicatrical occlusion of the axillary vessels are greatly lessened. In fact, I have had no presentment of this condition in any case where this position has been strictly maintained until the wound was completely covered with new skin.

Fourth, the fourth requirement in after-treatment, following the extensive removal of supposedly infected cancer involved tissues, concerns the employment of active and vigorous movement of the edges of the wound circumference. This, however, will accomplish nothing until the bare space has begun to fill in with the resulting hyperplastic granular mass, which nature finally puts in the place of the removed structures. When this is properly manipulated, that is, massaged, a new skin, which is a remarkably good substitute for the original, develops. This usually requires ten days to two weeks before a good start is made. In the meantime the wound is kept sweet with the Carrel-Dakin or eusol solution. When the new tissue begins to appear the adjacent skin should be pushed toward the operated space, firmly and persistently, at least once each day. Failure to do this permits of the development of pale, grayish looking, easily bleeding, unhealthy granulations that will not cover with epithelium; but active, progressive, even forcible movement of the skin, as soon as the granulations are in evidence, encourages the development of a blood supply that initiates the development of a new epithelial covering in a most remarkable way. Curiously enough, the development of the new skin covering is not alone from the edge of the wound, but it springs up often, after two or three weeks of this persistent manual movement of the skin edges, all over the operated field. At first it looks as if small, isolated patches of frost were appearing, with the difference that they are less white than frost. These changes, when they

begin to show, expand rapidly, and within forty-eight or seventy-two hours there is no doubt as to what they are. But this epithelization never develops, while the unhealthy, bleeding, secreting granulations, described above, still persist. There is always an unfailing evidence that the massage and movement of the normal skin surrounding the operated field has been insufficient to make the necessary healthy changes required for the development of the new skin.

Fig. 11. Showing the movability of the new skin following an extensive cautery dissection in an advanced breast carcinoma, November, 1914. In this patient flaps were made of the upper part of the wound with the cautery and applied over the axilla. Movement of the arm was practically normal in a year following the operation.

The phenomena here described of the development of this skin covering, following this method of management, are so remarkable as to almost, if not quite, establish a new principle in the surgical healing of large wound surfaces. The skin that results from this procedure or treatment is more normal in appearance and, therefore, much more efficient than any that can

be obtained by the so-called Thiersch grafts. The latter, when planted on these large areas of denuded surface, remain firmly attached to the underlying surfaces, and as such easily and frequently break down because too fragile to serve well as a normal skin covering. At each daily dressing of the wound the whole area is actively moved and the arm massaged from the tips of the fingers to the shoulder. There is a remarkable absence of pain or increase of temperature following this operation, either in the region involved in the treatment by the cautery knife or when the arm is moved at the wrist, elbow, or shoulder. The administration of even a small dose of morphine is almost never required. It is true that it requires a longer time for one of these patients in the hospital than when the wound is covered by skin flaps at the primary operation. But you can always have the satisfaction of knowing that in your cautery wound you have left no active cancer cells for the production of a subsequent recurrence of the disease. More than this, if distant metastases have not already taken place, you can not fail to have a better final operative result than has so far been possible by any other method recommended for the treatment of carcinoma of the breast.

DISCUSSION

Dr. Horace G. Wetherill (Denver, Colo.): Dr. Percy deserves great credit for having the courage of his convictions in following up the cautery plan in the treatment of cancer of the breast. Those who have had the most experience with carcinoma of the breast will not be inclined to accept his criticism of Rodman's statistics. We teach that cancer in its primary period is local, and, if a complete early operation can be done with the cold knife, that cancer is curable.

The basic principle upon which Dr. Percy works is correct, for implantation rarely occurs in an eschar or upon granulation tissue. Many recurrences have occurred in the breast and elsewhere from implantation following the use of the

cold knife. His method has advantages. There is a great deal we do not know in regard to cancer. There are different types of cancer and different degrees of malignancy, and reports of cures are correspondingly erroneous.

I hesitate to criticize what Dr. Percy has offered us as I am not sufficiently familiar with it, but the difficulty in using the hot knife in the axilla would seem to me to be great. I am sure that, if I should use the hot knife in the axilla as he apparently does, I should anticipate secondary hemorrhage, and I am sure that I should not sleep at night.

Dr. Leonard Freeman (Denver, Colo.): I want to compliment Dr. Percy on what he has done. It is a very radical departure from what we are all doing at the present time, but the only excuse for accepting it would be a larger number of cures than are obtained from other procedures.

What does his operation really mean? It means, Dr. Percy claims, that we can go a little further with the cautery work than we do with the cold knife. In order to gain this short distance we subject the patient to much more than we otherwise should, not only at the time of the operation, but afterwards; but why not go a little further with the knife? It is hard enough to get patients to submit to operation anyhow, and, if we accept this rather stupendous procedure of Dr. Percy's, I feel convinced that there are many women who would refuse operation altogether, thus losing more lives by cancer than would ever be saved by the cautery.

It is now beginning to be thought in many quarters that the lymphatic distribution of cancer is not increased greatly by the use of the knife; hence that argument in favor of the cautery is open to question, at least.

I should feel that it requires strong proof of just one thing,—that more women get well—before we are willing to adopt this radical method. I agree with what Dr. Wetherill has just said, that in these bad cases of cancer dissemination has already taken place into various organs of the body, so that any kind of an operation would be useless, either knife or cautery. In fact, I am inclined to believe that in the great majority of cancers the operation as it is done today offers as good a chance as Dr. Percy's operation, unless he can prove that more cases get well by the cautery than by the knife—it is a question of statistics rather than of theory.

Dr. Samuel C. Plummer (Chicago, Ills.): The same thing occurred to me as to Dr. Wetherhill, that is the danger of using the cautery so close to the axillary vessels. How can you use a cautery to separate those glands immediately behind the veins? Dr. Percy has evidently not had this trouble, but it seems to me it is dangerous. As to the time of healing: I would like to have Dr. Percy enlighten us more. How long does it take to heal these wounds? The question comes now whether it is better to do a more radical operation on cancer of the breast or to rely on other means of stopping dissemination of the cancer call afterwards by *x*-ray or radium.

Dr. Byron B. Davis: (Omaha, Neb.): I confess I have been becoming more optimistic the last two or three years with reference to cancer of the breast than ever before, and when Dr. Percy criticizes the statistics of Rodman of a 50 per cent cure of these cases, it seems to me that he is criticizing something that is probably correct. I read a paper on this subject before this Association one year ago.

We have 60 per cent alive and reported as well. This was an eye-opener to me. The percentage was larger than I had expected. There is a possibility of there having been some cases of diagnostic error, but I had these specimens examined by pathologists, and the very few not examined were probably carcinoma.

What we want to get at is a cure of as large a number of these cases as possible, and the great thing, the important thing, in reference to this particular disease, is getting the operation early, and I want again to say a word in regard to the advisability and necessity of the public being educated with reference to this disease, so that the operation will be done early. In some of the cases Dr. Percy showed here the disease was very extensive and apparently was very far advanced. The last three or four years my cases have been earlier.

In regard to the operation: There are just three or four points that are important, and one is that there are three methods of dissemination: first, by way of the lymphatics in the axilla; second, by the lymphatics to the epigastric triangle, and, third, those that cross to the other side through the superficial lymphatics. When we do an operation we have to surround those areas.

Another point is the dissemination under the skin is from

the fascia underneath the skin outward and not inward; then to remove a very large portion of the fascia clear over to the sternum clear down into the epigastric triangle and up into the neck. I cannot see how it is possible to clean this out with a hot knife without causing a dissection of the vessels.

Dr. A. F. Jonas (Omaha, Neb.): The treatment of breast cancer with heat is not a new one. I recall Nussbaum, who, in 1883-4, removed the breast affected with carcinoma with tinner's irons, and he claimed more cures and longer freedom from recurrence than by the usual operation with the scalpel.

Byrne, of Brooklyn, for many years used the galvano-cautery in uterine cancers; and in his published statistics, about thirty-five years ago, he showed better results than by any known method of treatment. Heat, as a means of treating cancer, for some unknown reason, was forgotten until it was revived in a modified form by Dr. Percy. Those of us who have made use of it can testify to its value. I am sure it deserves a more extended trial, and I have no doubt that it will find a permanent place in our warfare against cancer.

There is an interesting problem in connection with the history and growth of cancer, and that is this: Why in some breast cancers, where the neoplasm is small, do we have early recurrences, and in others where there is extensive involvement, so as to seem hopeless we have no recurrences even after operations that have not been as thorough as they might?

A woman came to me with an ulcerating surface on her left breast four times as large as a silver dollar. There were large nodules in the axilla. I said to her that I thought she would live longer without an operation than with one. She was determined to have an operation and said that she would take all the chances, why would I not do what I could; and I decided to operate. I am sure that I did not do as thorough an operation as if the case had not seemed so hopeless, and if I had advised an operation myself. Eighteen years passed by and one day there appeared a woman in my office, but I did not remember her. She said, "I am Mrs. So-and-so," and shook my hand violently, and I thought she was somewhat familiar on short acquaintance. And then she began to describe the case. I said to her, "You do not mean to say you are still on earth." She said that she was passing through the city and thought she would come in to see me. She exposed her breast, and I never had a more beautiful

scar. "You see, doctor," she said, "this is a letter J, you have left your mark on me. I am still entirely well."

Some years ago, while in Baltimore, Dr. Halsted, of Johns Hopkins University, took me into his laboratory and showed me a mass of fat the size of my four fingers from the supraclavicular space in cases of breast cancer, which had been hardened and sectioned, and on the cut surface there were little round bodies, every one of them a small cancer. Those specimens showed two important points: early metastasis and effective control of the normal body cells in so far as they destroy cancerous cells. I believe Dr. Freeman's statement is a correct one when he says these normal body cells undoubtedly destroy cancer cells. If they did not, every breast cancer would be hopeless in view of the early metastases.

Dr. Rea Smith (Los Angeles, Calif.): I have had the opportunity of seeing Dr. Percy do this operation, and I can assure you the operation in his hands is a very safe one, and the patient the next day after the operation is perfectly comfortable.

Dr. Percy has done one case for me. I had a patient with a recurrence high in the axillary fold. I stood by as he made an incision with his cautery over the shoulder along the clavicle to the midline down to the abdomen and back up the side to the starting point. He dissected out the mass which surrounded the artery and the vein and brachial plexus entirely with the cautery, left the wound open, and tied the patient's arm over her head. She was perfectly comfortable the next day, and the wound healed with no graft, and at the present time she has no recurrence. It was the most remarkable surgical operation I have ever seen.

Dr. Percy (closing): I fear that the President will not permit me at this time to reply to all the questions suggested by your very generous discussion of my paper.

Let me venture a prediction: When you once learn this technic with the cautery knife, you will submit your patients with cancer to nothing else. It is not as difficult or as dangerous to dissect the axilla and neck with the hot as with the cold knife, and there is this immense advantage: You have the very comfortable assurance when using it that you are not scattering loose cancer fragments about that will soon spring into new virulence. A fact that we overlook in trying to estimate the difficulties in using the cautery knife about blood

vessels especially is, that these tubes resist the heat in much the same way that my water-cooled speculums do. It is for this reason that you can apply the end of the cartridge-shaped cautery head to a gland that is adherent to a blood vessel until it pops as pop-corn does when subjected to the proper amount of heat. In this way you can safely destroy the gland with its load of malignant cells, and you do not harm your blood vessel. Nerve tissues especially stand much more heat without permanent impairment than is ever required for the destruction of a mass of cancer.

I want to repeat: This technic has to be learned just as any other technic. Our overshadowing adherence to preconceived ideas prevents many of us from accepting statements that seem to us to conflict with these ideas. Some parts of this discussion will illustrate this. "Fire burns," therefore you cannot use it about a mass of cancer involving blood vessels or nerves. But you do not, as a rule, need to use a burning temperature about vital structures involved in cancer. All that is required is a temperature sufficient to melt fat. Usually when we see one of these great masses of cancer, we immediately pronounce the patient hopeless and refuse to attempt to do anything. But practical experience has shown that patients with these great exuberant masses have a better chance for getting well when their growth is destroyed with fire than do those with the small infiltrating type of growth. My work with the cautery can show many cases in proof of this statement.

A GROUP PLAN FOR THE DISCUSSION OF HARELIP AND CLEFT PALATE DEFECT

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I promptly state that there is no effort made to offer anything new on this subject but to present a rearrangement of known facts, with a purpose of indicating more sharply surgical requirements.

Grouping of cases is not popular. Karl Grunberg, writing from the embryological standpoint suggests four groups: (1) lip; (2) alveolar arch; (3) hard palate; (4) soft palate, but this grouping does not quite fit into the surgery of the condition. Whether surgical groups have been suggested and found wanting, or whether the plan will be considered as quibbling over synonymous terms and only add confusion, I do not know, but it has for me simplified the general consideration and formed a very satisfactory method of description.

It may appear presumptuous for one with a comparatively limited experience in surgery of this defect to find fault with the present concept of the subject, a subject which has received the attention of the most eminent surgeons of the world, who have offered to any and every student a complete and voluminous literature. It often appears, however, that there is a seeming haze of mystery over the subject, an unorderly arrangement of facts in which the anatomy and embryology sometimes appear more important than the surgery, and that the discussion is not direct and lucid as to the condition under debate. The technical details are, I think, approaching standardization; but the classification and descriptive terms are uncertain and some attention in this direction seems to me necessary.

The reason for the plan to be presented are as follows:

1. The Many Combinations of the Deformity.—Anatomically there are fifteen forms of cleft palate. (Brophy). There are several degrees of harelip which, in combination with palate, present an array of degrees that are most confusing unless grouped or classified from a surgical standpoint.

2. The Multiplicity of Technical Details.—There are approximately nine operations for the lip defect, and there are several procedures for the palate specifically advocated by their sponsors. Many times these methods seem opposed, but evidently yield satisfactory results; all of which point to the fact that there must be some underlying technical principle that permits this variance. It is also demonstrated that the same technical principles apply to several forms of the defect, but that there are certain combinations which require special procedure not indicated elsewhere. Is it possible, then, to group or define cases according to these special steps?

3. The Descriptive Terms are Anatomical and not Surgical.—The terms in use are simple, single, double, complete, incomplete, first degree, second degree, third degree, used in connection with the lip or palate or in combination. The exception I take to these terms is that they do not indicate the surgical problem except by implication. The choice of them as applied to the individual case, varies with the individual observer and there is no order for their use.

4. Harelip.—This is itself a fanciful term without foundation, either embryological, anatomical, or surgical and is used only as a simile. It is so apt and has been in use for so many years that it would be futile to attempt to discard it. But the condition is really a cleft lip and is similar to cleft palate only involving different tissues. The two names, harelip and cleft palate, together with the anatomical terms, tend to create the impression that each defect and the combin-

ation is a separate surgical problem, a detached condition, a special situation with but little relation to the whole subject. So frequently are they associated in the same individual and the surgical problems so interlocked that they should not be divorced in any consideration of the subject if it can be so arranged.

Whether or not these exceptions may be considered by you as well taken, nevertheless I found it necessary to formulate some rules for my own guidance. Based upon consultation with eminent authority on embryology and upon my own clinical experience and observation, I arrived at two leading conclusions:

1. Harelip and cleft palate are not two separate and distinct entities, but simply a degree of defect in the same embryological process of union.

2. The paramount anatomical situation affecting the surgical repair from all angles is the condition of the alveolar process.

Two subsidiary conclusions influencing to some degree my opinion on the technical features are as follows:

1. Normally these tissues are closed from before backwards.

2. The bones of the face in the new-born baby do not become fixed or rigid under an arbitrary period of three months.

Therefore, if there are embryological data to prove that all of the many, many combinations are degrees of defect of the same process, is it not proper to speak of them as a part of the whole subject?

If it can be considered conclusive from a surgical standpoint that the condition of the alveolar arch is the critical situation, will it not be proper to group all combinations in relation to it?

It is suggested then that any case coming for treat-

ment be considered from the viewpoint of four surgical groups defined as follows*:

Group I. Harelip of any degree in which the alveolar process is normally closed.

Group II. Cleft palate of any degree in which the alveolar arch is normally closed.

Group III. Unilateral cleft of the alveolar arch.

Group IV. Bilateral cleft of the alveolar arch.

This grouping brings out clearly these acknowledged and proven facts:

Group I. If the baby is born with the arch closed, no matter what the defect anteriorly, the technical principles are the same whatever the degree or extent of the deformity. The procedures are comparatively simple and pretty well standardized all over the country. It is then proper to record the case as Group I.

Group II. With the arch closed the operations are pretty well defined, the extent of the deformity of the palate making but little difference. Recorded and spoken of as Group II, cleft palate.

Groups III and IV. If they be born with the arch open, then the whole subject is so elaborated as to permit of wide discussion and debate, but it also permits us to show that there are technical steps in the 3rd group which do not apply to the 4th group, and vice versa. It is admitted that the condition of

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*Following the meeting, the late Dr. Harry M. Sherman accepted the grouping of cases, based upon the alveolar process, as a reasonable classification, but objected to the definitions. He suggested that the condition of the process be indicated in every case as follows:

Group 1. Pre-alveolar cleft.
Group 2. Postalveolar cleft.
Group 3. Unliateral alveolar cleft.
Group 4. Bilateral alveolar cleft.

It will be noticed that the term harelip is discarded, as suggested in the paper, and the classification is made from the standpoint of clefts located in reference to the process and the surgical requirements for repair. With these surgical groups in use it then becomes possible to record anatomical varieties under them.

the process is the important condition in them, therefore why not directly indicate it?

Speaking of and describing the various defects in groups seems to me to be substantiated as follows:

1. They correlate the several conditions with embryological facts.

2. They separate the several conditions according to their special surgical requirements.

3. They define strikingly, definitely, and directly the important situation in the surgery of this defect, the condition of the alveolar arch.

4. They offer a very orderly plan for the discussion and communication with each other of our personal opinions in these age-old problems of time and sequence of operation and technical details.

Time and Sequence of Operations.—In Group I. the problem is purely cosmetic. It is true that the defect causes difficulty in nursing of the new-born, but artificial feeding is possible and satisfactory. Without associated defects no penalty is paid by delay in the repair, and the operation is entirely a matter of convenience, equal results being obtained when done the first day, the first week, or postponed until adolescence or later life. Performed with a minimum of shock and danger, it should and can be done as early as possible compatible with the condition of the child.

In Group II the operation carries with it a greater traumatism, more difficult maneuvers, a longer procedure, more dangers of loss, and postoperative complications, and therefore requires a careful study of the age and general physical condition of the patient.

Phonation, intonation, and the various forms of our speech effects are herein so transformed as to render these people marked among their associates. The rule that the palate be closed before speech

Fig. 1. (Berry and Legg.) The paramount anatomical situation influencing the surgical repair is the condition of the alveolar process. If the baby is born with the process closed, no matter what the degree or extent of the cleft in front, the principles of the repair are the same, and they form a surgical group. Clefts posterior to a normally closed process can be grouped readily,as it is evident that the surgical procedures on the palate are different from those of the lip. If the process is open on one side, the problems are greatly elaborated; principles of Group 1 and Group 2 are involved, but there is an added surgical question, —the hiatus in the process. Similarly, when the process is open on both sides there is an added step not present in the other groups. Looking at the cases from the standpoint of clefts, it is then possible to locate them in reference to the process and the surgical requirements for repair.

Fig. 2.—Group 1. Pre-alveolar cleft (see foot-note). There are several degrees which may be indicated under the surgical heading, which indicates in the records that cleft is limited to the lip.

function is developed is proper. It can be done at any time of life, and even in adults wonderful results may be obtained by the proper care and development.

Fig. 3. It is difficult to obtain a photograph of the second group, but if the lip and process are normally closed then any cleft posterior is called a Group 2 palate or post-alveolar cleft, thus differentiating it from a Group 3 and Group 4 palate.

Fig. 4.—Group 3. or unilateral alveolar cleft. It can readily be seen that this is a different surgical case from Group 1 and Group 2, as in this case there are a series of surgical operations required to complete the case.

Before the end of the first year is quite satisfactory, but in selected cases, by attention to a few details, I am closing the cleft at an earlier age.

Group III. The various debates as to the treatment of this group give rise to the question of sequence of operation. By reason of the alveolar arch hiatus, mechanical measures as typified in the Brophy oper-

Fig. 5—Group 4. Bilateral alveolar cleft. There are problems in this case not present in the others.

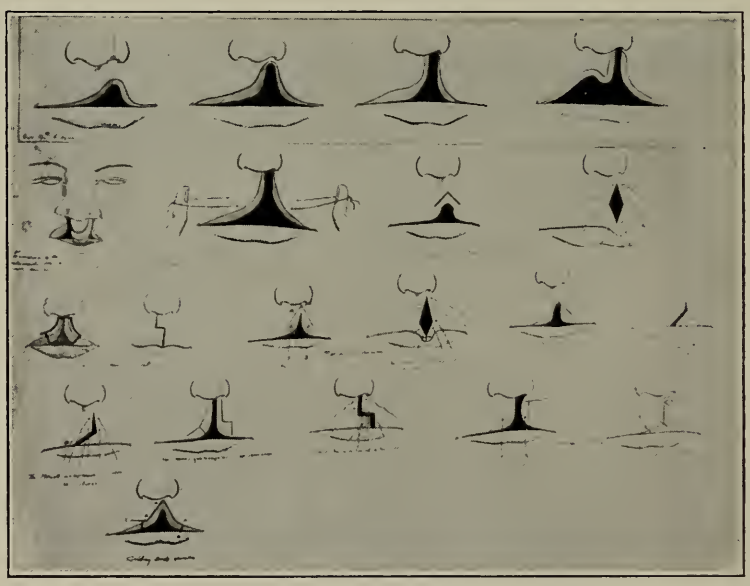

Fig. 6. The late J. Clark Stewart prepared this chart showing the many ways of repairing the lip. Considering the great mortality of the lip tissue it is generally considered that wide denudation and lateral appoximation are sufficient.

ation have been suggested as primary procedures for its closure. I believe that the operation of Dr. Brophy does just exactly as he claims for it, but I think the

impression is broad that it is to be used as a routine measure on all palates, whereas its greatest application is in the 3d group.

It is a clinical fact that these methods are efficient in closing the arch and narrowing the palate cleft, but as regards the closing of the cleft added surgery is required. The method, I believe, has been misconstrued in general as being an operation on the palate, whereas the effect, so far as I know and have seen, simply closes the arch. Mechanical measures are now generally questioned as to their necessity as it is easy to demonstrate that equal results in the larger per cent of this group may be obtained by first building the lip.

The second primary proposition is the embryological fact that normally the fusion of the face tissue takes place from before backwards.

It seems most reasonable to me to believe that in the early fetus the mechanical effect of the lip by pressure upon the pliable unformed bones behind it materially helps in their fusion. So do we see this effect in the living baby as it is a frequent experience to see the alveolar process closed within ten days after the lip operation.

The third primary proposition, that the bones of the face do not become fixed under an arbitrary period of three months, is borne out of this observation of lip pressure; and, while mechanical measures also prove this fact, I believe they do not take into consideration the equal effects of the lip. Therefore, while in Group I. the first consideration is the Cosmetic result, in Group III we have added the very important mechanical effect which I believe is the first consideration. Delay in operation allows the process and maxilla to become set and leads towards a more difficult later operation on the palate; therefore, I think, I can say positively, that it is essential in the third group that the lip should be repaired at the earliest possible date, as soon as the baby is established, and preferably with-

in the first ten days or two weeks. The palate to be done as in the second group.

Group IV brings up the same considerations as the third group, with the added feature that the lip repair is more extensive and is complicated by protrusion in various extent of the premaxilla.

Mechanical measures here also are employed, dealing not only with the arches but with the premaxilla. These have all been tried out with the conclusion that no more is accomplished than by the early closure of the lip.

The points then as regards age are as follows:

Group I. Any time that is convenient, early operation giving better control of the baby and greater ease of accomplishment.

Group II. At the end of the first year, but, owing to improved methods, possible to do earlier in selected cases.

Group III and IV. Essential to perform lip operation within first three months; preferably in the first ten days or two weeks, because of its mechanical effect, the palate falling then into the consideration of the second group.

Surgical Considerations in the Repair of the Lip—All lip conditions, whether falling in the first, third, or fourth groups, are repaired with attention to the following four principles:

1. Reposition of the alæ.
2. Approximation of the mucocutaneous border.
3. A long lip.
4. A thick lip.

These points are made in the effort to accomplish the best possible cosmetic effect, which is the end in view with the simple harelip.

In the third and fourth groups they are performed, first, for the mechanical effect on the arches and palate, and, second, for the cosmetic effect.

There are many, many procedures for the repair of the lip, with which the names of Nelaton, Malgaigne, and six others are associated, each operation deviating from the other in some angulation or line of incision and denudation. At present the general attitude is that such steps are unnecessary and their use takes but little cognizance of the extraordinary mobility of the lip and cheek tissues. The fact that they may be moved widely makes a straight simple line denudation possible.

Every confidence may be placed in the viability of these tissues. It is most difficult to cut off their blood supply, and they will stand, in comparison with other body structures, an unusual amount of suture tension.

In all plastic work upon the face and lip, union of wounds is enhanced by an appreciation of the fact that there are three separate layers of tissue: (1) the skin, (2) muscle and connective tissue, and (3) the mucous membrane. A stitch placed through all three tends to contract any denuded surface. One of the very important features of the operation is the approximation of broadly denuded surfaces, and this is best accomplished by including the mucous membrane and muscle layers in one series of sutures, while the skin is approximated separately, or the same result obtained by closing the mucous membrane by one line of stitches and the muscles and skin together, as is always done in lower lip operations.

The acceptance of this principle then permits one a wide variation in the selection of suture material and methods of insertion. And there are many suggestions in this regard: silver wire with shot to hold the nostril in position, insertion of silk specially prepared, knots on the skin side, knots on the mucous membrane side, and so on.

The point is that it seems to make but little difference what is used so long as the principle of two series of sutures is used.

The accomplishment of reposition of the alæ is the most difficult procedure, and the reason of failure is the lack of appreciation that the attachment of the wing of the nose to the mid-line is not a point, but an approximation fully an eighth to a quarter of an inch, that is, there is a well-defined base to the nostril. Therefore, one stitch, whether it be a retention suture or skin suture, cannot be expected to make this wide closure. Two stitches at the nostril are always necessary. I think the demonstration of this point has given me more satisfaction than almost anything else in connection with the closure of the lip.

If we accept the statement that lateral angulations are unnecessary, and straight-line denudations are indicated, one can then follow easily the mucocutaneous border from the ala of the nostril towards the mouth corners a sufficient distance, sometimes measured equally by dividers, and simply suture the lines laterally. In doing so, however, a wide surface of denudation is required, and an extra strip of mucous membrane is removed. The wider the strip, the thicker the lip that results; the longer the lines of incision, the longer the lip.

In approximation of the mucocutaneous border the main difficulty, in the single lips, is that on the short side the mucous membrane tends to roll inward; plenty of mucous membrane on the long side and not enough on the short, resulting in a corkscrew effect. This usually corrects itself, but it can be controlled by extending the mucous membrane incision beyond the skin incision sometimes leaving an uncovered area which always heals.

In placing tension sutures I have elected to put them on the mucous membrane and muscle side, believing that main structure of the lip lies there and also because, with the denuded lip everted, a wide deep

stitch can be accurately placed embracing a definite positive bite of the muscle tissues, while the knots leave no scar, and, should the stitches cut, no penalty is paid as wounds on this tissue heal readily. This permits very fine approximation stitches in the skin, of horsehair or dermol, with the assurance of a minimum of scar on the line of union.

I began by placing in a number of tension sutures (sometimes five or six), but I believe that only three are necessary: two at the nostril close together, and one at the mucous membrane border.

The technical requirements are as follows:

1. Straight-line incisions.
2. Wide denudation of the mucous membrane.
3. Two-point suspension of the ala.
4. Two series of suture lines.
5. A clean wound.

Following this various suture materials and methods and manner of insertion of them may be employed as selected by the individual operator. These principles apply also in closures of the lip in the third and fourth groups. In double incomplete harelip of the first group, and double complete harelip of the fourth group, there are several suggestions and illustrations which are for me personally impossible of accomplishment, particularly those that bring again into use the right-angled incisions. By their use I find that approximation is difficult and, even when satisfactorily done, they yield a lip that still is deformed in that it may be excessively long with the result that the mucocutaneous border is pulled to a marked degree under the premaxilla.

Several writers, notably Brown, have concluded that the right-angled incisions are not proper and suggest in the double lips that each notch be repaired separately. This conforms to the first principles, but it is my experience that it is most difficult to make a

presentable vermillion border, and in those that I have attempted it was necessary to perform a secondary repair.

I have in these cases compromised with myself by using straight-line incisions in the form of a Y. The angulation on the premaxilla may be criticised as contrary to the first principle of technic mentioned, but at least the incisions are straight lines and so far the closure is eminently satisfactory.

The Surgical Considerations of the Palate.—Simple incompleted cleft palate is not infrequently an easy operation. Undertaken before the twelfth month, a complete success is assured. When, however, repair is delayed until later life there are greater chances of failure, particularly with the soft palate, which, having no function over a period of years, tends to atrophy with the result that there is a minimum of tissue with which to work.

Closure of the cleft deals, not with the palate bones, but with mucoperiosteal flaps which are separated from the palate bone and swung from the alveolar arches, a trap-door effect, known as the Langenbeck operation.

In this group, as in the third and fourth groups, Mr. Lane suggests that the flap on one side be cut from the alveolar arch, swinging from its attachment on the cleft margin and then sutured under the rising flap in the opposite side. On account of limited tissue and some of the very flat roofs, the Langenbeck procedure is impossible, and the only method is that suggested by Mr. Lane. Leaving the palate bone denuded, the appearance of the operative field is most discouraging, but in my limited experience the viability of these flaps is most extraordinary. The operation is not generally accepted as a routine procedure, and surely the appearance of the resulting palate in no way compares with the old time methods. As a second procedure in closing holes following the ordinary operation, partial flaps are eminently successful.

The mobilization of the flaps is usually easily accomplished by elevators. The soft palate is separated and loosened by cutting sometimes through the posterior pillars. It is no uncommon experience to be able to bring the uvula almost to the front of the alveolar arch.

The first essential in cleft palate is relaxation. It is an entirely different condition from that of the lip. The tissues are more friable and normally fixed, and unless tension is removed failure is certain. This has long been appreciated and to such a degree that every illustration of cleft palate work includes what seems to me enormous relaxation lateral incisions. I find that they are necessary in only about one-third of the cases and seldom to any such degree as ordinarily shown.

The second consideration is a wide approximation of denuded surfaces. Any attempt to simply bring together edges of the mucoperiosteal flaps results in failure, because their edges are very thin and have a minimum blood supply. There are several illustrations in the books and periodicals where this margin is cut away; but thus far in my work this tissue is used and is important, I think, in preserving the contact of the real palate. By everting this edge into the mouth by the use of the mattress stitch it is often that a definite raphe can be made which protects the tissue beneath.

The soft palate can be sutured readily. There is definite muscle structure. Mattress sutures do not seem to do well, and, I think, it is the general practice to place single stitches on the mouth side and continue them around the uvula upon the nasal side, which is easy of accomplishment owing to the great relaxation possible of this tissue. All plates, wires, tapes, and the like are now obsolete.

The point of failure is at the junction of the hard and soft palate and may occur in any case and under the most favorable circumstances. Secondary operations are most satisfactory and it is in this situation

that the partial lateral flaps, after the manner of Lane, are so successful.

Brown has anticipated this occurrence and suggests that only the hard palate be done at the first sitting. It is a constant observation that in many cases there seems to be more palate tissue as time goes on, and what seemed to be a very difficult closure at birth results in a really high-arched palate. It, therefore, seems a reasonable procedure to close the hard palate early and the soft palate at a later date and thereby anticipate the post-operation holes. I have not as yet subscribed to this procedure but am quite favorably disposed.

The fourth group brings up special consideration dealing with the protruding premaxilla. This group carries with it the greatest deformity, which is in some degree fortunate for the child as I find that parents will not permit delay and we get these babies at the earliest possible moment.

All principles hereto outlined apply to both the lips and the palate. Mechanical and operative measures are suggested to relocate the premaxilla. The one step universally deprecated is the removal of this bone. The resulting deformity is so evident and marked as to be but little improvement on the original condition. This procedure is, however, still occasionally done by the uninformed but it is entirely unnecessary and cannot be too severely condemned.

It has also been the form to excise a V-shaped piece from the vomer in order to allow the premaxilla to fall in contact with the alveolar arches. Illustrations are shown in which the distance to which this vomer is excised is extraordinary. Such maneuver will permit the premaxilla to go back so far as to present a condition similar to complete removal.

In many cases, notwithstanding the seemingly wide gaps to be covered, it is possible to build the lip without touching the vomer at all; the lip bringing it back into position and over in some cases too far.

In conclusion, I will say—

1. That each individual case be immediately placed in one of the four groups and that the degrees of defect in that group be dispensed with as confusing and complicated.

2. That if the surgical principles, as outlined in both lip and palate work, be accepted they permit of a wide variation in technical details.

3. That the constant clinical observation of the mechanical effect of the lip upon the tissue behind, in the third and fourth groups be accepted as all-important in indicating early operation.

4. That plasticity of the bones of the face holds for three months and in some cases longer, and that this makes early lip repair imperative.

5. That the most reasonable basis of closure is to follow nature's path and form.

DISCUSSION

Dr. C. D. Lockwood (Pasadena, Calif.): It seems to me that Group 3 is the most important one in getting cosmetic results. I want to bring out a simple procedure that has been of the greatest benefit to me. You see all kinds of fancy diagrams in the text-books that work out nicely diagrammatically, but none of them gives you good results in surgery. I have followed the simple procedure of taking a pair of compasses and measuring the distance on both sides accurately from the location of the alæ nasi to the junction of the skin with the mucous membrane on the lip margin. From this point another measurement is made on the mucous membrane. Exactly the same measurements are made on both margins of the harelip, whether it be single or double.

The edges are freshened, connecting the points marked by the compass, and if these are accurately approximated you will get perfect union. But even where you get a beautiful Cupid's bow at first union there will often be a flattening of the nose later from lack of bony support.

Dr. H. M. Sherman (San Francisco, Calif.): I have run against the same obstacles, but in a little different direction. I have not tried to follow nature as closely as he has. I like to close the lip first, then the back part of the palate, and then the front part. I cannot agree with Dr. Lockwood about the bony union, as I do not think they have unity by bone. I have found there was no bony union, but there was union of mucous membrane. You could put a needle through where it looked as though there was bone. It would be a very poor criticism of a plan that others had spent years upon to criticize it in a few minutes. The difficulty is to get union of border, and it is a difficulty which we will encounter for a long time to come. I ask that we be forgiven for some bad results. We do the best we can.

Dr. William T. Coughlin (St. Louis, Mo.): There are very few surgeons who like to do this kind of work. I do not know why, as it is very interesting.

Dr. Ritchie mentioned a point that is not very often paid attention to by those who do this kind of surgery, and that is the closing of layer by layer. I was once in a position where people were forced to look at me, and they would say, "Why don't you take the stitch through and through, and be done with it?" That is the way they do it generally, but one has far better results closing layer by layer. Generally speaking, in doing work on the face where the wounds come through into the mouth, one gets better results if he can approximate the mucous membranes without putting the stitch into the mouth.

I think it is well worth while in harelip to look for the muscle ends, as they can be grasped and approximated. I think it is very important to close layer by layer in any wound of the face, especially where muscles intervene in the wound.

Dr. A. E. Benjamin (Minneapolis,) Minn.): In closing the cleft palate and harelip, we get better results by not doing too much at one time. It has been my custom to do the lip first, and close the soft palate next. It is surprising what little work will have to be done after that. The mucous membrane of the hard palate may be brought together quite easily some months later.

CONTROL OF CHRONIC PAIN

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Current medical journals are full of accounts of operations designed to restore the lagging functions of youth and are read with avidity by both the medical profession and the laity. Possibly the reaction from the destructive processes of war has stimulated an effort upon the part of the writers to conserve life to the uttermost and to make procreation, even by the senile and by the abnormal, the great aim of the investigator.

While these attempts to stretch the span of life beyond the allotted three score years and ten and to restore the waning power of the sexual glands are worthy of admiration, there are some problems of a nature so practical and so pressing that there is some excuse for directing our energies away from the more alluring search for the fountain of youth. Among these is the urgent need of a method for the accurate and scientific control of chronic pain, especially that due to recurrent inoperable malignancy. The intractable pain of tic douloureux stimulated attempts to give relief to the sufferers by a method less hazardous than the surgical removal of the gasserian ganglion, which had an operative mortality of 50 per cent in the hands of the most experienced operators. To this end avulsion of the ends of the branches of the trifacial nerve, as far as possible beyond their foramina of exit, was practiced with temporary relief. This plan was succeeded by the injection of the nerve trunks by 2 per cent osmic acid. Relief was obtained by this plan for varying periods, but it had the disadvantage of being extremely irritating to the surrounding tissues and frequently caused necrosis when the injection was not accurately made into the nerve sheath.

Injections of alcohol of varying strength have proved satisfactory in a large number of cases of facial neuralgia and have produced analgesia for periods of six to eighteen months. Thus the effort to short-circuit the painful area in facial neuralgia constitutes the first accurate, scientific, and safe method of combating chronic pain.

It seemed possible, therefore, to render other areas analgesic in which the paths of pain conduction were accessible to the injecting needle. If it is possible to perform almost any type of operation under local anesthesia why should it not be just as feasible to render any given field painless for a greater length of time?

While the material at hand did not give an opportunity to test out a great many areas, the results achieved in the cases treated at least justify a more extended application of the principle, that is, local anesthesia for the relief of chronic pain.

As the experimental and clinical data have not been sufficient to render an exhaustive report, this paper is presented rather as a preliminary study than as a complete work. The possibilities of mastering pain in hopeless conditions of malignancy was the incentive under which this work was undertaken. Every surgeon has seen cases of malignancy in which apparently none of the older methods gave relief. The woman with recurrent carcinoma of the breast, rocking constantly to and fro with the pain, is a not uncommon patient in any large hospital. The dread picture is familiar to us all, and yet so far no work has been undertaken for its relief. Many persons have no fear of death, yet who does not dread pain?

In many situations chronic pain may be controlled by interrupting the paths of pain conduction by the methods in vogue in local anesthesia. The scientific accurate control of pain will do much to rob the course of hopeless malignancy of its horrors. The mental anguish may remain, but the somatic suffering in most

cases can be spared to the patient. The relief of constant pain revives the drooping spirits of the sufferer and enables him often to put on weight and to gain in strength. The time-honored but inefficient attempts to produce an euthanasia by the administration of ever-increasing doses of opium or other narcotics must give place to a procedure which is efficient and which preserves the individual as himself to the end.

The short-circuiting of the painful areas is accomplished by nerve-blocking in the form of neurectomy or of intraneural injection. In relatively small superficial malignant lesions the same end may be accomplished by the healing of the ulcer by radium. This is especially true of lesions about the orifices of the body. Nerve-block relieves pain during the period of healing.

The agents used for intraneural injection are numerous and it is probable that no single drug is suitable to all cases. Chronic pain due to some condition other than malignancy is perhaps best treated by salt solution, novocaine, apothesin, or quinine and urea, because these produce but temporary loss of pain conduction. In painful states due to malignancy in which loss of motor function is of little moment, alcohol injections of the nerves or neurectomy is indicated. In cases of recurrent mammary carcinoma with great swelling and edema of the upper extremity, the patient usually has to carry the involved arm almost as a foreign body. Pain and swelling are so great that movement is practically impossible. Under such circumstances permanent block of the brachial plexus is indicated either by alcohol injection or by nerve resection. Nerve-block of the posterior sensory spinal nerve roots or intercostal nerves is frequently necessary as an adjunct to brachial plexus block because of metastasis in the tissues of the chest.

In thorax operations injection of intercostal nerves is best done at the lateral margin of the erector spinæ muscles near the angle of the ribs rather than close to the spinal column. On account of the many

injections necessary when all the intercostal nerves are blocked it is better to mark out the points of attack first and these are later connected by a line of infiltration reaching from the first to the twelfth rib. The patient is in a sitting position with the spine flexed and the shoulder on the affected side carried forward. The nerve-block is now done by introducing the hollow needle just inside the infiltrated area about on a level with the spinous process of the first dorsal vertebra. The point is carried downward until the resistance caused by its contact with the first rib is felt. The under border of the rib is now sought and as soon as the point meets no more bony resistance the needle is forced in for the distance of one-half centimeter further and 5 cubic centimeters of solution injected. The same procedure is carried out in the second rib and so on until the desired area has been blocked off. After fifteen minutes there is analgesia of the ribs, muscles, and pleura from the point of injection posteriorly as far forward as the sternum.

Kuhlenkamp's method of blocking the brachial plexus for the relief of acute and chronic pain in the upper extremity is as follows: The first rib is palpated just above the point where it passes beneath the clavicle. Slightly external to this the pulsation of the subclavian artery may be felt. The hollow needle is introduced just beyond this. If blood appears the needle is carefully withdrawn and introduced more laterally. It is carried downward until the resistance of the first rib is felt or until the patient feels the referred pain in the arm. The syringe is then attached and 5 to 10 cubic centimeters of 0.5 per cent solution apothesine or novocaine injected. Care should be observed not to use the needle as a lever because of the danger of tearing the subclavian vein. Analgesia appears in about fifteen minutes.

It is not necessary with the use of novocaine or apothesine to inject the nerve sheath, although this is desirable because these agents are diffusible while with quinine and urea or alcohol it is necessary to in-

ject the nerve sheath. It is therefore recommended that the plexus be exposed by incision under local anesthesia when permanent analgesia is required for the relief of pain due to malignancy. With the plexus exposed either alcohol injection of the cords or section should be done.

ILLUSTRATION

Case 1.—An emaciated almost moribund French woman of about sixty years with a scirrhous carcinoma of the breast. The primary tumor was about the size of an orange, and ulceration of the mass was advanced. There were metastases in the axillary and supraclavicular regions but there had been no swelling of the arm. Pain had not been a marked symptom in this case because of the slow growth of the scirrhous tumor, but there was a continuous ache and discomfort.

A small cutaneous infiltration was made in the usual way just outside the point at which the calcareous subclavian artery was palpable. This spot lay in a deep fossa behind the clavicle which was elevated in the position of forced inspiration by the emphysematous character of the thorax. The needle was introduced at the point where the first rib passes beneath the clavicle. The patient exclaimed when the needle came in contact with the brachial plexus. Referred pain in the upper extremity is the sign that the needle has reached the desired spot. The syringe was then attached to the needle and 10 cubic centimeters of one-half per cent apothesine or novocaine solution introduced, at which time the needle was carried more deeply into the plexus. After the blocking of the brachial plexus the intercostal nerves of the same side from the second to the tenth rib were infiltrated at about the outer border of the erector spinæ muscles and the points of injection were connected with a perpendicular line of infiltration.

Case 2.—This women was operated upon about one year before and now has a recurrence in the scar and axilla with brawny infiltration of the skin and elephantiasis of the arm, the tissues of which closely resemble the bark of a tree in color and consistency. This woman complained of great pain in the chest, but comparatively little in the arm. Infiltration of the skin was done with great difficulty on account of the induration and the brachial plexus reached as evidenced by the patient's complaint of referred pain in the arm and hand. Ten centimeters of one-half per cent novocaine solution were injected into the plexus. This was the more difficult because the patient was unable

to sit up. The intercostal nerves upon the same side from the first to the ninth were blocked in the usual manner.

Case one died within twenty-four hours following the nerve blocking. In this case, however, the fatal termination could not be charged to the novocaine injection as much larger doses have frequently been used without any systemic effect, and it is a matter of general experience that eight to ten ounces are within the range of safe dosage when used over a large area and in tissues from which the rate of absorption must be slow. Case 2 was free from pain in about fifteen minutes after the injection. She had complained of a sense of constriction about the chest before the nerve block but this distressing symptom disappeared, allowing of comfortable respiration. Forty-eight hours later there had been no return of the girdle pain.

Case 3.—Sarcoma of the shaft of the humerus in a man of forty. There was enormous swelling of the arm, the soft tissues being tense and shiny. Ulceration had not occurred. The patient was brought into clinic in a wheeled chair, rocking his body to and fro and moaning with pain. The brachial plexus was blocked by the method of Kuhlenkamp and within ten minutes the patient was free from pain. The following day the radical operation with removal of the shoulder girdle and arm was done under general narcosis and the patient left the hospital as soon as his wound had healed so that further observation was impossible.

Case 4.—Chronic intractable pain of the upper extremity following hemiplegia. This woman complained of inability to sleep and loss of weight and strength because of the constant pain. The brachial plexus was injected by the method described and the patient had a good rest the following night. Forty-eight hours later she reported that there had been no recurrence of the pain.

From the results obtained in the cases above described the belief is held that much of the suffering endured in the past may be avoided and the afflicted patient, though perhaps in an inoperable condition, may live out his days in peace.

With the pain gone, sleep becomes possible again, the general condition of the patient improves, and death finally supervenes as the result of toxemia, rather than from exhaustion due to pain.

Dr. James F. Percy (San Diego, Calif.): This paper deals with a most practical and important subject, especially as it relates to inoperable and recurring carcinoma. It is unnecessary to dwell at this time on the difficulty usually experienced in dealings with these sufferers, not only as to relieving them, but also as to their extraordinary demands on the surgeon. It is most gratifying and useful to have what can be done for them epitomized, as is done in this paper. In my experience the extreme of physical suffering is to be found in the destruction of the pelvic bones by carcinoma in women. I have had a few cases in which the bony pelvis had practically fallen to pieces. This same thing occurs occasionally in the advanced types of prostatic carcinoma in men. I have never seen these cases sufficiently relieved by morphine. The only help for them, in my experience, is the epidural injection of some local anesthetic, usually novocain into the cauda equina.

The medical profession, I am sure, does not meet sufficiently its responsibility in directing the dosage of morphine in the cases that we pronounce incurable. We do not adequately differentiate between pain due to psychic or functional causes and that due purely to the invasion of a destructive pathological progress. The former will not respond except to constantly increasing doses of drugs until finally a stage is reached where an amount of the drug sufficient to relieve psychic pain cannot be found. When this stage is attained an indescribable situation is reached, which requires an enormous amount of experience and judgment before the patient can be taught that his hope for relief, does not lie along the way of the morphine route. I have had patients of this type sent to me with advanced stages of carcinoma, one of them taking thirty grains of morphine a day. This woman stopped the use of the drug voluntarily within a week when she was assured there was a possibility of her getting help from her operation sufficient to permit her to live with her children for an unknown number of months in comparative comfort.

This case illustrated most practically that the suffering for which she was taking the great quantities of morphine was in her head and not in her pelvis. Yet some physician was responsible in the beginning for this woman's abuse of the use of opium. It is a most unfortunate mistake to turn over the administration of morphine to any member of that particular patient's family.

THE SURGICAL TREATMENT OF EMPYEMA BY A CLOSED METHOD[1]

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(PRESENTED BY INVITATION)

The surgical treatment of empyema has always been very unsatisfactory. The unusual prevalence of empyema during the World War made it one of the most discussed surgical subjects of this period and called forth numerous methods in attempts to lower the prevailing high mortality, which was 30.2 per cent in the various army camps during the winter of 1917-1918. The so-called open operation, which dates from the time of Hippocrates, with or without rib-resection, was the method most generally used and will long continue to be used regardless of comparative results, because of familiarity and the inertia of custom.

For eighteen months the writer had charge of the empyema wards at Walter Reed General Hospital, Washington, D. C. and the base hospital, Camp Pike, Arkansas, and developed what may be termed a closed method. Immerman, in 1887[1], described a method somewhat like the one about to be described, in that he inserted a single tube into the pleural cavity, air-tight, maintained negative pressure, but did not use a syringe to remove the fluid nor was any fluid injected. Since this time many methods, with some form of modification of the method described by Immerman, have been tried, with varied success.

This article is based on a series of 138 cases, 45 acute and 93 chronic, treated by the writer, with a mortality of less than 2 per cent, which is thought to be the lowest rate reported by any method in so large

1. See editorial note, Jour. Am. Med. Assn., February 1, 1919, p. 267.

a series. Reports have been received from 80 per cent of the cases, and no case, acute or chronic, is known to have recurred. It is believed the results attained by this method are sufficiently striking to warrant its being submitted as the simplest, the most efficient, and the most practical of all methods for the treatment of acute empyema.

This method is clearly demonstrated in two reels of films, which are available gratis, for use by any medical school or medical society, by addressing the Curator of the Army Medical Museum, Washington, D. C.

Details of Closed Method in Acute Cases.—Inasmuch as the success or failure depends upon many minute details, seemingly of minor importance, more space is given to the exact technic.

The place of election for operation is the eighth interspace in the postaxillary line. A diagnostic puncture at this point having revealed fluid containing microörganisms, the operation is performed at once regardless of the condition of the patient or the stage of pneumonia. Care must be taken to prevent wounding the lung. To avoid this accident the needle puncture is made just before hand and always at this point a puncture with a straight trocar, which should not have a long point. The cannula should be just large enough to admit snugly a standard Carrel tube.

The writer has found more than 2 c.c. of 0.5 per cent procain unnecessary and has performed the operation fifteen times without any anesthetic and with little pain to the patient.

At the site of operation a stab not more than 5 mm. in length, through the skin only is made with a curved bistoury. The cannula is smeared with vaseline to prevent the edges of the tiny wound from clamping it. The patient should have the arm and shoulder

raised, take deep breath, and hold it, thus separating the ribs as the trocar is inserted. The needle puncture, skin stab, and insertion of the trocar can all be done in less than a minute.

The tube should be about fifteen inches long, seamless, and have from five to ten fenestræ, about 3mm. in diameter and 1 cm. apart, within the cavity to facilitate the removal of fluid when fibrin clots are present. When the trocar is removed, instantly the tube is inserted through cannula, which is now removed, leaving about ten inches of the tube outside the chest.

The tube is held air-tight by the contracting wall of the wound, and may be connected with a Potain aspirator, or the fluid may be removed by a half ounce bulb syringe,[2] which is used in giving the treatments. Should the respiration become embarrassed from too rapid removal of the fluid it is advisable to stop a moment or inject 200 to 400 c.c. of Dakin's solution before continuing the removal. If the patient has a high temperature, with active pneumonia, normal saline is used, instead of Dakin's solution, to cleanse the cavity. This is done by refilling the cavity nearly one-third and agitating the fluid in the cavity by quick compressions and expansions of the bulb.

The small dressing permits free chest expansion. A No. 00 safety-pin is thrust through the edge of the tube. Two thin pads of gauze, each one one inch square, split to the center, are placed over and under the pin. A pad two inches square of twelve layers of bandage gauze, with a hole in the center, made by a pointed and rounded instrument, and never cut, so as to admit the tube snugly is then applied. Four strips of adhesive, each one and a half inches wide and three and three-eighths inches long, are applied so as to

2. The syringe and trocar used in this work are made by Becton, Dickinson & Co., Rutherford, N. J.

make the finished dressing square. This dressing will frequently last several days, as there is seldom any soiling around the tube unless the incision was made too large, or the patient has a very persistent cough, which should be controlled if possible. Should the dressing become soiled a razor blade is best to cut the dressing from the tube. Usually it will suffice to loosen one side of the dressing, change the two small pads, and apply a new strip of adhesive. The patient can lie in any position without discomfort or danger of the clamps or tube becoming loose.

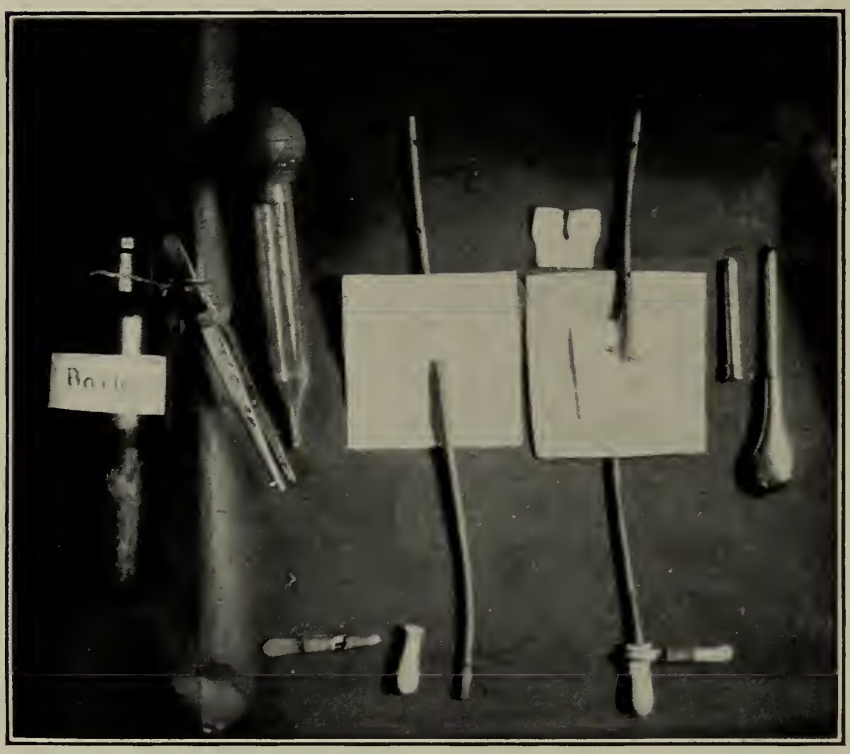

Fig. 1. Shows individual tissue forceps, syringe and bottle for solution. The top and bottom of a typical dressing is shown, also trocar cannula.

Each patient should have his individual tissue forceps, syringe, and Dakin's solution in a wide-mouth bottle, where the syringe is kept between treatments. The forceps facilitates handling the tube in preventing air from entering during treatment and makes the wearing of gloves unneccessary. The end of the tube

is kept sterile by being capped with the rubber from a medicine dropper held on by a Daeffenbaugh clamp which maintains the negative pressure.

In giving the treatment it is best that no air enter. The tube is first compressed with the tissue forceps, the clamp and cap removed, the nozzle of the syringe inserted with the bulb compressed, and the secretions aspirated. From 50 to 200 c.c., depending on the size of the cavity, of Dakin's solution are now injected and agitated. This is removed, and the process repeated until the return is clear. An amount equal to about one-fifth the original capacity is now injected and left in from five to thirty minutes, then removed, and the maximum negative pressure reëstablished. The treatments usually are given every four to six hours by day and once or twice at night until the pyogenic membrane and fibrous exudate have been dissolved, a process taking from two to fourteen days, depending on the kind of infection, duration of case, size of cavity, and the general condition of the patient. Subacute cases will tolerate more vigorous treatment, while cases with active pneumonia should be irrigated only every four to eight hours until the symptoms subside.

Glass piston syringes should not be used; unlike the bulb syringe, they are expensive, break easily, are troublesome to sterilize and difficult to handle.

The suction power of the bulb syringe will lift water to a height of eight feet in a 6 mm. tube. That it will prevent pneumothorax is clearly shown by a radiogram taken just before and after negative pressure is established. Very little suction is required to expand the lung, and frequently the patient cannot endure the pain caused by the maximum negative pressure of the bulb.

When the tube is purposely opened, air immediately enters as the lung collapses to a certain degree, which

depends largely on the adhesions and size of the cavity. If air so admitted is aspirated, the number of bulbs of air removed counted, and the whole process repeated the number of bulbs of air removed will invariably be the same; furthermore, if after a maximum negative pressure is attained and any known number, say 5, 15, 30 bulbs of air are injected into the cavity and the process reversed, the number of bulbs of air aspirated will always correspond with the number injected. The same is true if a liquid is used instead of air, thus proving conclusively that the empyemic cavity can be entirely emptied of either air or fluid. The same is true regardless of the position of the patient or whether the tube is inserted at the most dependent part of the cavity.

That negative pressure is maintained for several hours is shown by the sound of air rushing into the cavity when the tube is left open, and the patient feeling a change of pressure, or, if the tube is connected to another tube leading into a bottle containing Dakin's solution, the solution will be drawn into and fill the cavity.

When a large empyemic cavity is thoroughly cleansed and 150 c.c. of Dakin's solution injected and kept agitated a specimen withdrawn at the end of one minute will usually test about 0.38 per cent, and after five minutes will usually test about 0.07 per cent.

It is not essential that the sodium hypochlorite solution be 0.47 per cent, as 0.6 per cent can be used for a reasonable time with safety in the pleural cavity. With such a wide margin it is a simple matter for those who do not have the usual facilities for making and testing Dakin's solution to make up a solution sufficiently accurate from the various commercial products. Hypochlora-zene is used now and found to be both convenient and effective.

After the amount of secretion and sediment have been greatly reduced, usually in four to ten days, and smears and cultures negative or nearly so, instead of continuing the treatment as before one should change to and inject a twenty-four-hour-old solution of 2 per cent dilution of liquor formaldehyde in glycerine once daily for the following reasons:

1. Complete sterilization is attained in from three to seven days and the tube can be removed before the cavity is completely obliterated.

2. There is less discomfort to the patient, and his sleep is not disturbed.

3. The cavity is made to develop a tolerance for an antiseptic, which antiseptic it is advisable to leave in the cavity, when the tube is removed, to prevent recurrence.

4. The resultant secretion following the injection of the formaldehyde solution forms unfavorable media for bacterial growth, and when sterile will be readily absorbed and the cavity obliterated.

The first two or three injections, which should not be over 5 c.c., will usually cause a rise of temperature, and for this reason should not be used too early in acute cases. The amount may be increased up to 10 c.c., but larger amounts are not necessary. Before each injection the cavity is given the usual treatment with Dakin's solution. If there is much sediment present the regular two hour treatments with Dakin's solution should be given during the day, and the formaldehyde solution treatment given once for the night.

It has been observed that both smears and cultures sometimes will remain positive for organisms for several days after beginning this treatment, even when the secretion gives a positive test for formaldehyde. There will be, however, a gradual decrease in the

number of bacteria in both smears and cultures, and sometimes the latter becomes negative first.

Removal of the Tube.—The original tube is not removed until the case is completed. Just before the tube is removed the cavity is given a thorough treatment with Dakin's solution and from 5 to 7 c.c. of formaldehyde solution is injected and left in the cavity. The dressing should first be removed and the skin cleansed with ether. An iodine swab is inserted in the sinus and rolled around the tube. The finger, one inch from the sinus, will compress the sides of the sinus during and after the tube is quickly removed, to prevent air from entering. The sinus is again treated with

Fig. 2. Bilateral empyema under treatment. Tube on right side removed in thirty days, tube on left side removed in twenty days. Operated when patient had bilateral pneumonia.

an iodine swab, the field cleansed with alcohol, and the sinus closed with three wide strips of adhesive six inches long. Sometimes it is well, first to make two folds of skin over the sinus or apply a tiny alcohol pad. The second or third day it is well sometimes to remove the adhesive, treat the sinus and apply a similar dressing.

The amount of fluid secreted into the cavity after the tube is removed varies with the size of the cavity at this time, the number of treatments with the formalde-

hyde solution, and the amount left in the cavity when the tube is removed. This, however, is a matter usually of small importance. If this fluid is sterile it will be absorbed, sooner or later, or if necessary it can be aspirated, as in the ordinary sterile pleural effusion, and the cavity gradually obliterated. If the fluid reaccumulates and contains organisms the general condition, failure to gain weight, physical signs, and leukocytosis will be indications within a few days for the reinsertion of the tube, which was done in five patients, from whom the tubes were removed, very early as an experiment before sterilization.

Importance of Diagnosis.—The diagnosis of empyema is often difficult. There can be no doubt that many pneumonia cases die complicated with empyema undiagnosed. A large percentage of such cases diagnosed and properly treated could be saved. The diagnostic puncture or consultation in every serious pneumonia case, would often prevent this grave error. The presence of the army doctor at the autopsy table during the World War did much to quicken his interest in empyema. It is believed that if a law were passed making it compulsory for every pneumonia death to be autopsied by a county health officer, or any other qualified person, in the presence of the attending physician and all other physicians interested, undiagnosed empyema cases would be less frequent with eventually fewer deaths.

Who, even of the laity, has not seen or heard of a pneumonia case after having passed the crisis, sooner or later suffer a relapse and either die suddenly or linger along for weeks or months, and possibly years, then go to the grave with the death certificate signed "unresolved pneumonia" or "tuberculosis?"

Murphy was called in consultation once to see a patient who the attending physician said, had had pneu-

monia for six months, but it proved to be a chronic empyema.

Osler says: "In pneumonia the practitioner should be on the alert if the crisis is delayed or the temperature rises after the crisis, if chills and sweats follow, or if the cough changes to one of paroxysmal type of great intensity."

While the early diagnosis of fluid in the chest is important it is of even more importance to remove the fluid early and keep the cavity empty with the least disturbance to the patient. The effusion sometimes begins soon after the onset of the pneumonia and large quantities of fluid can collect within a few hours. Here we wish to state, with emphasis, that operation, at any stage of the disease regardless of pneumonia, by this method can always be done without the least danger of shock or collapse of the lung, and that those operated on earliest after onset give the quickest and best results.

While the röntgenographic and bacteriologic laboratories are always to be preferred, they are not absolutely essential with this method of treatment.

Exercise.—No uncomplicated empyema case should be kept in bed. From the day of operation, graded, regular systematic breathing, and calisthenic exercises are the quickest way to cause expansion of the lung and chest mobility. Unfortunately, the novelty of the Woulfe bottles wears away soon. Naunyn's plan was found efficacious: The patient sits in a chair compressing the well side against the arm of the chair, and taking long, deep breaths, which force the expansion of the compressed lung. Only for the first few days after the tube has been removed should he refrain from exercise.

Food.—The appetite is the natural guide for the

kind of food. Abundant food is an all-important factor in treatment. The comfort of the patient and his ability to take exercise greatly aid the usually ravenous appetite. Many of the cases gained a pound a day for several consecutive days.

Empyema at Walter Reed Hospital.—Twenty-three acute cases were operated on at the Walter Reed Hospital. Eleven of these were reported by the writer[3] and 12 operated upon during the influenza epidemic. Of the latter group 9 cases were operated on when the patient was either nearly moribund or had an active pneumonia.

Reports since September 1, 1919, from 7 of these cases show good condition. Four cases, 3 recently operated on, had complications and were still under treatment when the writer was transferred to another hospital. These 4 cases, before the closed treatment method was completed, all had a secondary operation, with rib resection, followed by long, convalescent periods.

One of these 4 cases was very remarkable in that 7240 c. c. of thick pus were removed from the left pleural cavity at operation. A careful search of the literature reveals no record of a greater amount of pus ever having been removed at one time from one pleural cavity. The direct smear showed 60 bacteria per field and culture was pure streptococcus hemolyticus. Negative pressure was impossible because of a bronchial fistula. A radiogram just before operation showed a dense shadow except the right upper chest and immediately after operation showed the left lung completely collapsed, which accounts largely for the complete absence of shock, although two hours were consumed in removing the pus. The fistula closed on the third day, and the radiogram showed expansion of the lung, but

3. Jour. Am. Med. Assn., December 21, 1918.

the patient could not endure the pain caused by the maximum negative pressure. During the six weeks the patient was under closed method treatment; he gained twenty-five pounds, was still twenty pounds underweight and gradually improving. The patient was then subjected to rib resection and treated by the open method with Dakin's solution. Four months later he deserted, with his sinus still discharging.

One case of this group is the only acute empyema case the writer has had the misfortune to lose. This patient had been ill six weeks following influenza and pneumonia. He was nearly moribund, delirious, extremely emaciated, had positive blood culture, pericarditis, multiple abscesses, and general arthritis, when a right trocar thoracotomy, in bed, yielded 1500 c. c. pus. The next day a left trocar thoracotomy yielded 2000 c. c. of pus. A radiogram now showed the chest clear and no pneumothorax. Before death, three weeks later, the blood culture was still positive.

Empyema at Camp Pike.—The 92 cases treated at Base Hospital, Camp Pike, Arkansas, may be divided as follows:

Group I. Forty-nine acute cases operated on by the Diederich method before January 9, 1919.

Group II. Twenty-two acute cases operated on by the writer's method after January 9, 1919.

Group III. Twenty-one chronic cases admitted from other hospitals, having had open operations on an average of four and a half months previous.

Group I

For some months Lieut. Diedrich[4] had been using a somewhat similar method, to be described later, but

4. Surg., Gynec. and Obst., April, 1919

with many essential differences. Up to January 9, 1919, there had been 107 cases treated by the Diedrich method at Camp Pike. At this time there were 74 cases remaining in the hospital, 25 convalescent and 49 still under treatment. Five of the 49 had been operated on before October, 16 in October, 17 in November, and 7 two weeks prior to January 9.

These latter 7 cases were closed on an average of twenty-six days after operation by more vigorous treatment with Dakin's solution and, in addition, the use of formaldehyde solution, while the 25 convalescent cases had averaged fifty-one days with Dakin's solution alone. Most of the convalescent were in excellent condition. Two had a recurrence and were retubed for three and seven days respectively with no recurrence.

Of the 49 cases only a few had been operated on before the pneumonia had fully subsided. An average of fifteen days had passed since the diagnoses of empyema, and an average of five aspirations had been done before operation.

Thirty-six of the 49 cases were closed permanently on an average of eight days with the combined Dakin's and formaldehyde treatment. The cavities varied from 30 c. c. to 600 c. c. Röntgen ray reports on many showed a pneumothorax. The remaining 13 cases had complications and required longer time. Three were bilateral empyemata, 9 had a bronchial fistula, and 7 had necrosed ribs, due, it is thought, to injury to the periosteum at the time of operation and required resection.

Treatment of Chronic Cases Secondary to and Following Open Operation.—While this treatment is not to be recommended, the closed method may be instituted after open operation in acute cases which have

TABLE OF CASES, GROUP II.

No. of case. Name	Onset of pneumonia	Aspiration.		Operation		Side.	Character of fluid.	Organism	Days tube was in cavity.	Disposition
		Date	Amount in c. c.	Date	Amount in c. c.					
Case 1, W. McG.	Oct. 5	1.9.20	5	1.10.20	330	L.	Thick pus	Pneumococcus	16	Duty, Feb. 11
Case 2, W. H.	Nov. 16	11.29.20 12.3.20 12.11.20 2.5.20	400 100 10 100	2.6.20	500	L.	Thick pus	H. S.	18	Duty, Mar. 27
Case 3, R. B.	Oct. 26	3.7.20	10	3.8.20	325	L.	Thick pus	H. S.	7	Duty, Mar. 28
Case 4, McK. R.	Dec. 23	1.17.20	800	2.1.20	1200	R.	Thick pus	Non-H. S.	36	Duty, Mar. 28
Case 5, G. N.	Feb. 19	2.23.20 2.24.20 2.25.20	550 900 850	3.5.20	1800	R.	Serous	H. S.	14	Duty, Apr. 15
Case 6, E. K.	Dec. 28	....	....	3.5.20	320	R.	Thick pus	H. S.	7	Duty, Mar. 31
Case 7, L. O.	Jan. 17	1.20.20 1.21.20 1.22.20	1500 400 350	1.24.20	750	L.	Thin serous	H. S.	42	Duty, Mar. 20
Case 8, A. P.	Jan. 13	....	....	2.1.20	540	L.	Thin pus	H. S.	12	Duty, Mar. 24
Case 9, L. H.	Jan. 9	1.16.21 1.23.20	1500 700	1.31.20	1050	L.	Thin pus	H. S.	21	Duty, Mar. 20
Case 10, B. C.	Dec. 10	12.16.20 1.3.20	680 75	2.3.20	750	R.	Thick pus	H. S. Staphylococcus	12	Duty, Mar. 24
Case 11, A. G.	Dec. 4	12.20.20	25	2.420	450	R.	Thick pus	H. S.	4	Duty, Mar. 27
Case 12, H. W.	Jan. 4	1.8.20	30	1.14.20	2250	L.	Thin flaky	H. S.	29	Duty, Mar. 1
Case 13, L. D.	Dec. 13	12.25.20 to 1.29.21 7 asp. Apr. 1.	 5400 Dry	1.30.20 2.15.20	600 750	L. L.	Thin pus Thin pus	H. S. H. S.	9 19	 Duty, Apr. 4
Case 14, G. T.	Jan. 12	1.16.20 1.19.20	650 1040	1.30.20	2100	R.	Thick pus	H. S.	45	Duty, Apr. 7
Case 15, H. W.	Dec. 18	1.3.20 2.2.20	100 50	2.3.20 2.21.20	300 100	R. R.	Pus; thin pus	Pneumococcus	10 23	 Duty, Mar. 30
Case 16, J. H.	...	....	....	6.4.20 6.8.20	800 300	R. R.	Pus Pus	H. S. H. S.	4 8	June 16, transferred to General Hospital, No. 12.
Case 17, A. S.	Apr. 2	4.15.20	10	4.16.20	1200	R.	Thick pus	H. S.	42	Duty, July 23
Case 18, P. McL.	Feb. 24	3.2.20 3.3.20	550 1050	3.4.20	500	L.	Serous	H. S.	48	Duty, June 6
Case 19, R. D.	Jan. 14 mumps	1.19.20 1.21.20 1.23.20 1.28.20	1475 1450 800 1800	1.31.20	1800	L.	Thin pus	H. S.	45	Duty, Apr. 15

been subjected to rib resection or intercostal thoracotomy and have failed to be cured. Necessarily, these chronic cases are usually more difficult to handle than acute cases originally treated by the closed method.

The sinus may be nearly closed and have to be dilated with a curved hemostat to faciliate the introduction of the small tube. Large sinuses require

THREE BILATERAL CASES, GROUP II

Case 20, R. H.	Oct. 3	10.24 to 1 7.21								
		4 asp.	2450	....	....	L.	Thin pus	Pneumococcus		
		2 asp.	400	....	....	R^1	Heavy pus	Pneumococcus		
	...	....	....	11.10.20	950	R.	Heavy pus	....	60	
	...	11.28.20	1125	....	....	L.	Heavy pus			
				11.28.20	930	R^2	Heavy pus	....	32	
				12.1.20	200	R^3	Heavy pus	...	49	
		12.4.20	440	....	....	L.				
				12.1.20	200	R^3	Heavy pus	....	49	
		12.4.20	440	....	....	L.				
		11.30 to 1 1.20								
		10 asp.	2800	....	....	L^1	Pus			
				1.31.20	300	L.	Pus	Pneumococcus	14	Duty, Mar. 3
Case 21, H. T.	Oct. 1	10.9 to 10 14.20		....	....	R.	....	...	..	Weight normal, Transferred to General Hospital No. 12, June 16, bronchial fistula.
		4 asp.	1550	....	....	...	Serous			
				10.16.20	200	R.	Serous	H. S.	40	
	...	10.21.20 to 1.9.21	1.9.20							
		15 asp.	3900	....	....	L.	Pus	H. S.		
				2.1.20	700	L.	Pus	H. S.		
Case 22, R. B.	Feb. 24	3.2.20	450	....	....	R.	Thin pus	H. S.		
		3.3.20	1050			R.	Thin pus			Small cavity.
				3.4.20	550	R.	Thin pus		30	
	...	3.10.20	10	.....	....	L.	Serous	H. S.		
				3.11.20	560	L.	Serous	H. S.	20	Duty, May 20

larger tubes so as to fit fairly snug and make possible negative pressure. In a few days the sinus will usually close sufficiently that the large tube may be replaced by a smaller tube.

The treatments are much the same, but may be more vigorous than in acute cases. If the sinus is narrow

and deep, or the cavity so small that negative pressure is no factor, the tube should be inserted, almost full length of the sinus, and at least twice daily the cavity filled to overflowing with Dakin's solution. Following each treatment in the smaller cavities enough formaldehyde solution should be injected to cause the resultant secretion to overflow around the tube. Sometimes it is best to give hourly treatments during the day and the formaldehyde solution but once during the night.

Fig. 3. Bilateral case five weeks after operation. Returned to duty four weeks later fully recovered. Shows size of scar.

No case should be subjected to a Schede, Eastlander, or Delorme operation under six months, nor before strong negative pressure has been persistently applied for a reasonable time.

A secondary open operation is indicated under the following conditions: ribs necrosed from pressure or injury, a persistent bronchial fistula, multilocular or small irregular cavities, and when the lung is held

down by thickened pleuræ. After the secondary operation the wound should be closed, with a single tube leading air-tight into the cavity, which is then treated as if originally a closed method case.

After a reasonable time, though the cavity is not completely obliterated, if sterile, the proper amount of formaldehyde solution should be injected, and the tube removed. The unobliterated cavity will become filled with fluid, which, sooner or later, will usually be absorbed and the cavity gradually obliterated. At times it is advisable to aspirate two or three times generally following up with injection of small amount of formaldehyde solution, as was first used by Murphy.

Fig. 4. Bilateral empyema six weeks after operation. Note full chest expansion.

Report of Chronic Cases.—The following case is typical of the possibilities of this method.

Pvt. J. M., August 31, in France, had sixth rib resected for empyema following pneumonia. Admitted November 17, 1918, to W. R. G. H. Condition fair. White blood cells, 12,000. Hemoglobin, 75 per cent. Poor right chest expansion. Copious purulent discharge from small sinus upper right anterior chest. Patient said there had been no change in his condition for the last six weeks. A small tube was now inserted

through the sinus and 660 c.c. thick residual pus removed. Smear showed 55 bacteria per field. Culture staphylococcus. Radiogram showed large pneumothorax. This cavity was treated with 200 c.c. Dakin's solution every hour by day and every two hours by night for forty-eight hours. The maximum negative pressure for the first day caused much pain, due to the lung expanding. During the next forty-eight hours only four treatments were given in which 300 c.c. of Dakin's solution were injected and left in for thirty minutes, then replaced by 15 c.c. of formaldehyde solution. Following the fourth treatment 10 c.c. of the latter were left in the cavity when the tube and original dressing were removed. The sinus was healed permanently two days later. The secretion aspirated twelve hours after second and third treatments was a clear, serosanguineous fluid and the smears and culture of both were negative. December 16, patient had gained fifteen pounds; weight now normal; no pain; 150 c.c. yellowish serum were aspirated. Smear and culture both negative. Had no other aspirations or treatment. Chest expansion nearly full. February 2, returned from thirty days' furlough in excellent condition. Empyema cured.

Each of the 21 cases of Group III had a discharging sinus and cavities from 20 c. c. to 750 c. c. The closed method of treatment was instituted and tubes removed in 12 cases on an average of twenty-eight days. No report from 2, but the other 10 cases show good condition with no recurrence to August 1, 1919.

Report of a Case of Group III.—Name, H. R., November 1, 1917. Empyema. Rib resection. Healed September, 1918. Had been on a furlough two weeks when sinus opened. Two weeks later, February 1, 1919, was admitted to Base Hospital, Camp Pike, with profuse discharge from a small sinus. A small tube was inserted through the old sinus and 750 c. c. of residual pus removed. Culture staphylococcus and streptococcus non-hemolyticus. March 3, tube was removed, and sinus closed permanently in three days. March 24, returned to duty with full chest expansion and a gain of 26 pounds. September 2, reports excellent condition with no symptoms of recurrence.

Transfer of Cases.—On June 16, 1919, when the empyema ward at Camp Pike was closed, the remaining 21 empyema cases were transferred to General

Hospital No. 12, Biltmore, N. C. Thirteen of these cases had been operated on overseas by the open method. Three were admitted just before transfer, and the others had been under closed method treatment too short a time to effect a cure. Of the 8 remaining cases 1 had been operated on by the Phillips method; 4, Diederich's, and 3, the writer's method. Of the 4 cases belonging to Group I all had complications and had been operated on in October. Three cases, Nos. 16, 17 and 21, belonged to Group II. Case 16 had a bronchial fistula. Tube was removed June 10, and sinus healed permanently in a few days. Case 17 had gained ten pounds during the twelve days since operation. The tube was removed on the fourth day as an experiment, but had to be reinserted in two days. Case 21 was a bilateral case, with a persistent bronchial fistula, and required secondary operation.

The above 7 cases plus 2 more previously transferred and operated on at Base Hospital, Fort Sam Houston, Texas, represent the residue of 129 acute empyema cases having had a trocar thoracotomy at Camp Pike. Most of the cases were of virulent streptococcus hemolyticus infection and the mortality was only 9 cases, or 6.9 per cent. The mortality here had been 40 per cent, and at Walter Reed Hospital 32 per cent, with the open method as used at the War Demonstration Hospital, Rockefeller Institute, New York. Seven of the 9 fatal cases died during the influenza epidemic, and all had complications, 4 of which were bilateral. Had these 9 cases been uncomplicated or even under normal circumstances, with plenty of help and room, they too, in all probability would have lived. This is believed to be the lowest death-rate ever reported in so large a series of acute empyema.

These 9 transfer cases, only 6 of which had a secondary operation, after transfer to another hospital, compare most favorably to similar cases in other base

hospitals of large camps, one of which, Camp Lee, Va.,[5] when the empyema wards were closed in June, 1918, following the work of the Empyema Commission, had 140 cases transferred to General Hospital No. 12, Biltmore, N. C. These 140 cases had been treated by the open method with Dakin's solution, and more than half of them after transfer were subjected to major secondary operations.

Summary of the 45 acute cases treated by the closed method:

Number of cases having a bronchial fistula.....	8
Number of cases requiring a secondary operation..	1
Number of cases having a secondary operation before closed method treatment was completed....	5
Number of bilateral cases.....	4
Shortest number of days tube was in cavity.....	4
Average number of days tube was in cavity[6].....	25.2
Number of cases which had tubes less than fourteen days	18
Number of recurrences.....	00
Largest amount of pus removed at operation.....	7240 c.c.
Average number of days patient was in bed after operation	7
Number of cases having but one dressing.....	8
Number of cases having not more than three dressings	20
Number of deaths (bilateral case).....	1

Others Using the Closed Method.—Capt. Manson, Chief of Surgical Service, Base Hospital, Camp Dodge, Iowa, [7] reported 23 cases by the closed method, with a mortality of 8 per cent. In the conclusion of his article he states: "Our experience, we believe, justifies the opinion that the closed method thus described distinctly shortens the course of empyema, since it maintains constant negative pressure in the pleural cavity, prevents the collapse of the lung, promotes early adhesions between the lung and pleural cavity and prevents the secondary infections which are so common after thoracotomies. The simplicity of the technic, the minor character of the operation, the clean-

5. Surg., Gynec. and Obst., April, 1919.
6. Average for 18 cases at Camp Pike was 20.2 days. This does not include the four cases which had severe complications and averaged fifty-six days.
7. Am. Jour. Med. Sc., August, 1919.

liness and comfort of the patient and the economy of time and of dressing further recommend it as the ideal treatment of empyema so far devised."

Dr. Arthur W. Ralls reported in a paper before the Alabama State Medical Association Meeting, April, 1919, a series of 42 cases of acute empyema without a death by the closed method, during November and December, 1918, in the U. S. General Hospital No. 14, at Fort Oglethorpe, Ga.

He gives as factors favoring this method of treatment:

(*a*) This drainage is easily accomplished with the aid of local anesthesia only.

(*b*) Coughing is reduced to a minimum, whereas in costectomy the cough is painful and excessive for a few days.

(*c*) There is positively no shock, while the shock in rib resection is due to a collapsed lung and to disturbance of the natural pressure on the healthy side caused by the mobile mediastinum.

(*d*) There is not the added danger of secondary infection as in a large chest wound exposed often for dressings.

(*e*) The patient is more comfortable and cleanly and there is total absence of odor in the wards.

(*f*) It is possible to drain both cavities simultaneously if desired.

(*g*) By virtue of this method of drainage and the proper use of the blow-bottle and other lung exercise during convalescence, decortication of the lung will be rarely or never necessary.

(*h*) Dakin's gives better results when confined in the cavity for ten to fifteen minutes. This cannot be done under the open method.

Dr. Charles S. White reported before the District of Columbia Medical Society 12 cases with one death. The fatal case was that of a man, aged forty-five years, who had been delirious three days and moribund when 1500 c. c. of pus were removed at operation. This case followed a streptococcus laryngitis without pneumonia. Nine cases were operated on in four different hospitals and 3 in the home. All but 1 case were cured in less than five weeks.

Dr. William C. Borden, Dean, George Washington University Medical School, reports 5 cases with no deaths. One was a bilateral case, both sides operated on at the same time, which he believes to be the first in the District of Columbia to recover, and he thinks the man undoubtedly would have died under any other treatment.

Dr. Anderson Watkins, Little Rock, Ark., reports 6 cases by this method, with complete recovery in from two to eight weeks, and considers the method superior to any method, new or old.

Not all have had as good results as these surgeons. Major Dodge, Camp Sherman, Ohio,[8] reports 3 cases, all failures, by this method. He states "they were operated on nine days after the onset of pneumonia; all were very sick, and had large accumulations of seropurulent fluid which contained hemolytic streptococci. All seemingly went well and the tubes were removed the third week. Much disappointment soon followed when röntgenograms showed that the collapsed lungs were not expanding to fill the space." It is evident that due care was not exercised to prevent collapse of the lung. Furthermore, had proper negative pressure been established and maintained in cases operated on so early, adhesions would have formed, making impos-

8. Jour. Am. Med. Assn., June 21, 1919.

sible the "larger cavities," which Major Dodge states he later encountered. It is significant, however, that all three patients lived, even though secondary operations were performed, as compared to Major Dodge's mortality rate of 26 per cent in 68 cases by the open method. He not only condemns the use of Dakin's solution in the pleural cavity, but would hasten back to the "pre-war methods," and, he so sarcastically says, "relegate to the boneyard all of the many fancy treatments of empyema evolved by the faddist who has been privileged to observe a series of cases for a limited period of time."

The main trouble usually is that the exact closed method technic is not followed carefully or some modification is used, and on failure the whole method is condemned. It is now, and long has been, the universal opinion that those loudest in their condemnations of the use of Dakin's solution are those most ignorant of its use.

Comparison with Other Methods.—The method described by Phillips[9] is much like that described by Immerman, except that a metal cannula is left in the chest wall during the course of treatment.

In the Diedrich method by means of a special trocar and cannula the rubber tube is introduced indirectly by passing beneath the skin and fascia then over the top of the rib before entering the pleural cavity. This he claims acts as a valve to prevent entrance of air but allows egress of fluid. We think no tube soft enough to collapse here should be used, for if the tube would collapse under such condition, it would be an easy matter to force fluid by compression into the cavity, but difficult or impossible to remove it, because under suction the compressed tube would further collapse and thus prevent the suction from reaching the pleural

9. Jour. Am. Med. Assn., May 3, 1919.

cavity. The treatments are less frequent, less intense and no formaldehyde solution used. The operations are delayed and repeated aspirations made until the patient has passed the crisis. Glass piston syringes are used.

The method of repeated needle aspirations with or without the injection of an antiseptic, always means pain and a long convalescence with possible numerous complications. A case which can be cured by repeated aspirations alone in from four to ten weeks can usually be cured in as many days by the closed method.

The open method, with its numerous modifications, whether costectomy or thoracotomy, is gradually becoming more in disuse for some form of occlusion treatment. The writer believes that the time will come when rib resection as a routine in acute empyema will be considered malpractice. Many advocate simple drainage, with or without irrigation. Others add, sooner or later some form of negative pressure. The three-bottle gravity system which to a certain extent affords constant drainage is perhaps the most common of these methods. Caples, of New York, claims this method gives a pull of 20 mm. of mercury and that the normal negative pressure of the chest is 8 mm. The negative pressure of the bulb syringe is about 60 mm.

The large open wound not only necessitates large expensive dressings frequently changed, but invites contamination and cellulitis, in addition to systemic infection from the wound itself. The shock following the collapse of the lung, further embarrassing respiration, not infrequently causes death within a few minutes or hours.

Most advocates of the open method are agreed on delayed operation preceded by repeated aspirations, as indicated, until the pneumonia subsides, and adhesions

form to limit the collapse of the lung, making the operation more safe. This delay and repeated aspirations are not only unnecessary, by the closed method, but are decidedly harmful to the patient because of increased chances for complications. It is quite impossible completely to empty the chest by needle aspiration, as there is always danger of puncturing the lung with possible resultant bronchial fistula, pressure symptoms are only temporarily relieved, as a rule, the pleura gradually thickens, pus pockets form, the absorption of toxin continues, and many complications might arise which are too frequently offered in the necropsy report as an alibi for this procedure, as the cause of death.

Major Stone, Chief of the Medical Service, Base Hospital, Fort Riley, Kansas, reported[10] 310 cases of empyema, 37 of which were cured by aspiration alone and the remaining 273 cases were operated on by the open method with a mortality of 48 cases, or 17.5 per cent. He also reported in the same article one hundred deaths from empyema cases, which, as he states, "were not considered suitable risks for any kind of an operation except aspiration."

By a fair comparison with the writer's 2 per cent mortality in a series of 45 acute empyemas, the above series would be 410 cases, with a mortality of 148 cases, of 36 per cent. This rate is perhaps a fair average with the open method when all cases are included, as they should be, and it is in keeping with the statement by Lilienthal [11] that a mortality lower than 25 per cent in acute empyema may be considered good.

The writer has never seen an empyema case too serious to be operated on by the closed method, and

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10. Am. Jour. Med. Sc., July, 1919.
11. Military Surgery, June, 1919.

has operated on easily at least 25 cases which either had an active pneumonia or some other serious complication with but a single death. In no case was there collapse of the lung or the slightest sign of shock, and all showed immediate improvement. There is every reason to believe that if all such extreme cases were operated on by the trocar method most of them could be saved, even though a secondary operation, by rare chance, might be necessary.

Although the writer has had but 1 death, a bilateral case in 45 acute cases, and 1 death, a bilateral case, in 93 chronic cases treated by the closed method, he believes that this extremely low mortality rate would obtain in even a much larger series of cases. Especially would this be true if the bad risks were not operated on and only those patients operated on, as is usually done with the open method, who, by virtue of their own natural resistance or otherwise, have been enabled to survive the critical period and become good operative risks. Such practice, however, is believed to be not only a surgical sin but criminally wrong when early operation by the closed method offers quicker and better results, and a much lower mortality.

CONCLUSIONS.

1. Early operation by the closed treatment method has the following advantages:

(*a*) It can be done, regardless of the stage of pneumonia or serious condition of the patient, without the least shock or collapse of the lung.

(*b*) It provides complete evacuation of the empyema cavity, relieves cardiac and respiratory embarrassment and prevents the absorption of toxins and the usual resultant complications.

(*c*) It lessens the usual thickening of the pleuræ and prevents the lung, compressed by the exudate, from becoming fixed in compression.

2. The closed method has the following general advantages:

(*a*) Productive of great economy of time, labor, and dressing material.

(*b*) Causes the minimum pain and discomfort to the patient.

(*c*) The dressing is small, lasts several days, without skin irritation and does not constrict the chest.

(*d*) Uncomplicated cases of empyema are not kept in bed.

(*e*) Cases are less likely to have recurrence, become chronic, or need a secondary operation.

(*f*) The constant negative pressure gives maximum expansion of the lung.

(*g*) The scar is very small and there is no chest deformity.

(*h*) Practical in the home and in country practice.

(*i*) The postoperative treatment in greater part may be done by a nurse or a properly instructed member of the family.

(*k*) Bacteriologic and röntgenographic laboratories while always to be preferred, are not absolutely essential.

(*l*) The mortality is lower than by any other method.

(*m*) Can effect cure in acute bilateral empyema, both sides being operated on at the same time, with acute bilateral pneumonia present, which treatment is impossible by the open method.

3. Dakin's solution, because of its great solvent and bactericidal action, is the most nearly ideal solution to use in the preliminary treatment of the empyemic cav-

ity to dissolve the fibrinous exudate and partially sterilize the cavity.

4. Liquor formaldehyde in glycerin, 2 per cent dilution, is the best solution to use in the empyemic cavity after the preliminary treatment with Dakin's solution to complete sterilization, shorten the course of treatments, and prevent a recurrence.

5. Smears and cultures after the formaldehyde solution treatment is begun will each show a rapid decrease in the number of bacteria, which are sometimes found two or three days in the smear after the culture will be sterile.

6. Bronchial fistulæ are more common than is generally suspected. With this complication salt solution should be used in amounts as large as possible and not cause the patient to cough.

7. A hypochlorite solution of increased strength over Dakin's solution in both alkalinity and available chlorine can be used in the empyema cavity with safety.

8. The available chlorine in Dakin's solution after injection into the empyemic cavity rapidly decreases. The strength after one minute averaged 0.38 per cent, and after five minutes 0.07 per cent.

9. Dakin's solution can be made with sufficient accuracy from various commercial products by those who do not have the usual facilities for making and testing this solution.

10. The progress of acute cases when less frequent treatments were given indicates that cures can be effected in a little longer time by giving only one to three treatments daily.

11. Cases becoming chronic following open operation generally can be cured in a comparatively short

time by instituting the closed method treatment, so making unnecessary a major secondary operation of the Schede, Estlander, or Delorme type.

DISCUSSION

Dr. E. P. Quain (Bismarck, N. D.): In the successful treatment of empyema there are three problems which must be solved: (1) Evacuation of the exudate; (2) Sterilization of the cavity; (3) Obliteration of the cavity, chiefly by lung expansion. Several methods have been used in order to gain these ends safely and speedily, but all have some drawbacks. Even the excellent method just described and used so successfully by Dr. Mozingo has, to my knowledge, proved satisfactory in the hands of several other surgeons, who no doubt were less skillful in its employment.

In order to improve on previous methods and results in empyema treatment, my assistant, Dr. A. E. Brix, devised an apparatus which in our hands has given better satisfaction than any other method, including that of Dr. Mozingo.

(Apparatus demonstrated.)

The apparatus consists of a soft rubber belt applied tightly around the thorax. Two rubber tubes are attached, air-tight, through the belt and introduced into the empyemic cavity. One of these tubes serves to admit irrigating solutions as often and as much as desired. The second, the larger tube, passes into a vacuum bottle. This bottle is connected with a box containing a small motor and an air-pump. A mercury manometer is connected between the motor and the vacuum bottle in such a way that the pump automatically keeps up a definite, measurable, and controllable negative pressure in the bottle and, therefore, within the empyemic cavity. The result from this, even, negative, air-pressure between lung and pleura as against the slightly lower negative pressure within the lung is the immediate and constant tendency to obliteration of the infected cavity. We have found by *x*-ray observation that this obliteration does not take place entirely by lung expansion, but it is aided very materially by the raising of the diaphram, induced, of course, from the higher intra-abdominal pressure. This interesting activity of the diaphram has, I believe, escaped former observation. It is undoubtedly a very important means of hurrying a cure, that is, of helping the stiffened

and adherent lung to reoccupy the intrathoracic space from which it has been displaced by the exudate.

Up-to-date fourteen empyemas have been treated by this method, and it has been shown to possess the following advantages:

1. By using careful technic at operation, there need be no collapse of lung with consequent dyspnea, shock, and additional interference with mediastinum and the other lung.

2. The exudate is removed from the thorax as fast as it forms.

3. Dakin solution or other irrigating media may be applied an indicated.

4. The cavity is rapidly and smoothly obliterated by distension of the lung and elevation of the diaphragm from the constant negative pressure.

5. Nursing is simplified (no dressings.)

6. Convalescence is more rapid, and chronic empyema is, therefore, less liable to follow.

7. Although there has been no opportunity to apply this method to double empyema, it would seem to offer a practical solution in such a complication.

Dr. Mozingo (closing): The aim uppermost in my mind always has been to make the technic of this method both simple and practical. The chief reasons of failures heretofore in attempting closed methods have been due largely to special cumbersome apparatus which was difficult to install and easily deranged. The criticisms of this method generally come from those who either do not know or do not follow the exact technic. I have recently met many such critics who were honest enough to confess the same and now see why they had failed.

NOTES ON SURGERY OF THE MEDIASTINUM

Arnold Schwyzer, M. D., F. A. C. S.

ST. PAUL, MINNESOTA

Surgery of the mediastinum is not very often discussed in the medical journals because the conditions are rather rare and because each case presents mostly a peculiar problem of its own, which must be met in its own way. Surgery comes into question in inflammations, especially after injury, be it from direct penetrating wounds or from perforations, mostly from the side of the esophagus. In one such case I could convince myself of the easy access and good exposure of the posterior mediastinum by resecting several ribs near the costovertebral articulation. The pleura could be stripped free nicely and without injury. In this way good access was procured. I cannot convince myself that the procedure of Heidenhain is always preferable, where one enters upon the transverse processes of the vertebræ by an incision near the midline and frees the deep musculature of the back toward the side. Heidenhain then removes the transverse processes and the corresponding portion of the ribs. In this manner the danger of injury to the pleura is thought to be more safely avoided. Surely, the wound is much deeper and the orientation more difficult. Our case was a septic phlegmonous infection from a foreign body in a child. The operation, however, did not save the patient from the severe sepsis.

Purulent infections of the anterior mediastinum, apart from direct trauma, are mostly due to a breaking down of lymph glands or to the advance of an abscess which started in the neighborhood. Of each of these two conditions I saw one example. One was an abscess along the pericardium on the right side. It originated from a tuberculosis chondritis of the fourth, fifth, and sixth ribs. It had apparently started on the under

surface. The abscess formed a narrow cavity of about 4 or 5 cm. depth along the pericardium. As tuberculosis of the rib cartilage never heals, if only the affected portion is removed, the whole of the affected cartilages was thoroughly excised. Iodoform was rubbed into the wound; the wound was closed up to a fine silk worm drain, and healing occurred promptly.

The second case was a lymph gland abscess taking its origin from what seemed to be one of the right

Fig. 1. Skiagram of the mediastinal fibroma.

pretracheobronchial glands. Poirier and Cuneo mention that the glands of this group, the pretracheobronchial glands of the right side, are the most frequently affected ones among the peritracheobronchial group. The abscess in our case was located behind the second and third cartilages on the right side. After resecting these we entered the abscess cavity, at the depth of which (perhaps 5 or 6 cm. below the surface) a somewhat melanotic but principally chalicotic necrosed lymph gland of the size of a pealed

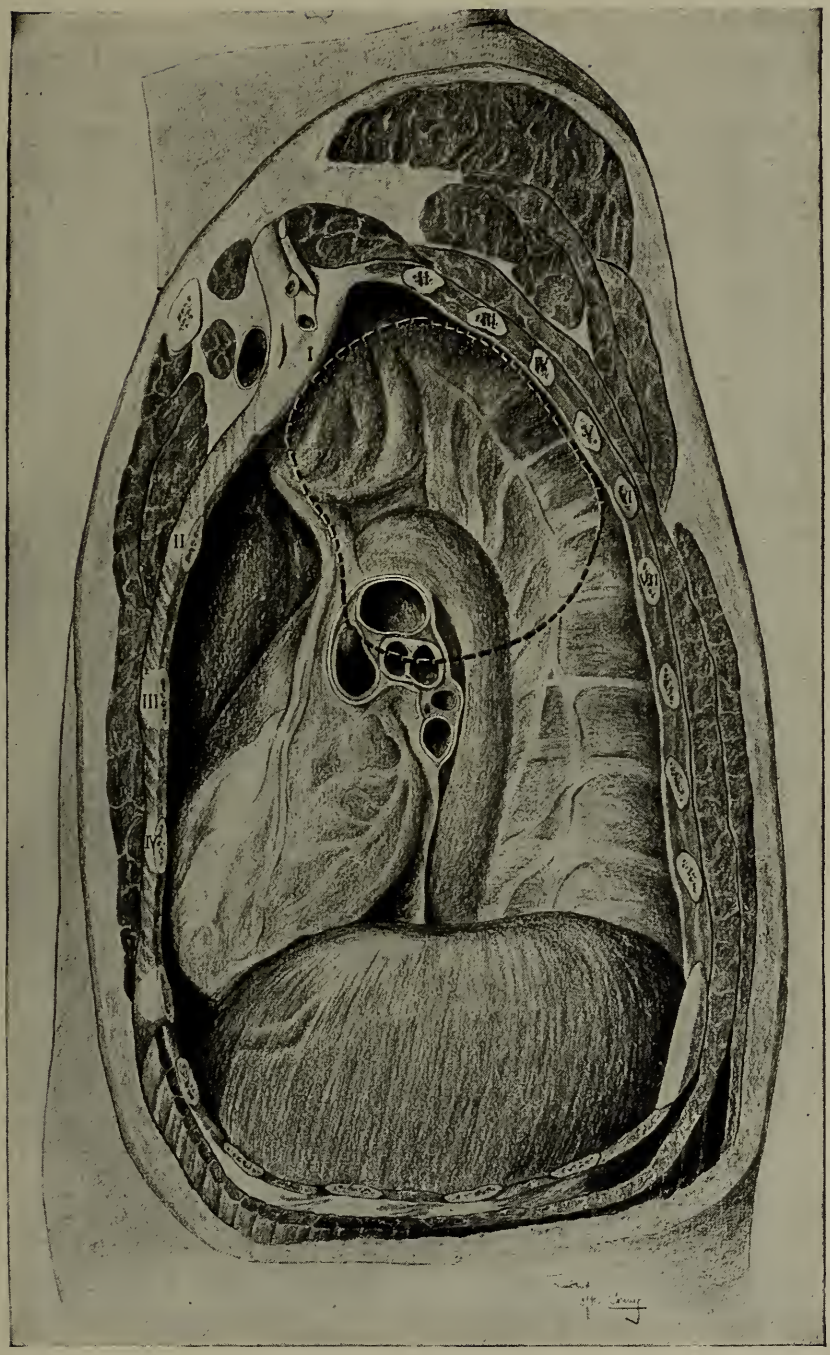

Fig. 2. Topography of left pleural cavity. (Taken from Corning's Topographic Anatomy) Location of tumor indicated by dotted line.

almond was fished out. The patient was a stone mason, which explained the chalicosis. There was little organic matter left in the gland; it consisted principally of grayish grit. Healing followed after a few weeks. The case became doubly interesting when our patient returned about three years later with a similar condition on the other side. This time the abscess pointed in the sternal notch, near the head of the left clavicle; and after incision we could enter

Fig. 3. Intranasal pharyngeal intubation. A well-curved piece of metal tubing directs the afferent rubber tubes away from the operator.

an abscess cavity downward and inward behind the manubrium sterni, again about 5 cm. in depth. Again a necrotic mass came out, though only after about a week. It was a necrotic lymph gland of the anterior mediastinum, belonging to the group which lies in the angle of division of the superior vena cava into the two innominate veins, and which Bartels (Das Lymphgefassystem) describes as lymphoglandulæ anguli

anonymi. Healing took place after six or eight weeks.

Apart from purulent infections the mediastinum may be the seat of quite a variety of pathological conditions, in the detection of which the Roentgen rays are by far the most important though not exclusive agent. The most frequent occurrence is a tuberculous enlargement of the hilum glands in connection with pulmonary tuberculosis. It is important to remember that in children such large lymph gland masses may often be primary, that is, without pulmonary findings and probably propagated from mesenteric tuberculosis. Occasionally, tuberculosis may affect the mediastinum in the form of a cold abscess with its origin in a vertebra or the sternum. Lues, in the form of gummata, or massive thickening around trachea or bronchi and the large vessels, is not very infrequent. History, Wassermann, and lesions in other parts of the body are of course to be taken into the reckoning. Hodgkin's disease and leukemia can form very large masses in the mediastinum. Compared with other shadows of the same extent they give the least local symptoms, be they circulatory disturbances, tracheostenosis, or difficulty at deglutition.

The thymus may be enlarged by simple hyperplasia, or it may be the seat of neoplasms, though one may rightly doubt the possibility of definitely recognizing the exact origin in any advanced tumor of this area. Especially the comparatively frequent appearance of lymphosarcomata in the anterior mediastinum is thought to have its origin in the thymus, but may of course have just as well the lymph glands of this area as matrix.

Intrathoracic goiters are among the most frequently seen tumors of the upper mediastinum. They represent a most important and interesting surgical subject, but can only be mentioned in passing.

Aneurysms are another affection of prime importance, particularly those of the different portions of the aorta and of the innominate artery. The Parisian surgeon Guinard reported good results in operation for the aneurysm of the truncus anonymus by peripheral

ligation, that is, ligation of the common carotid and the subclavian arteries near the aneurysmal sac. I operated on one case in this manner and I may be permitted to report it in short: The patient had been kept flat on his back in bed for six months, and for fear of rupture he had not even been allowed to sit up for a meal or any other function, like defecation. The two arteries were ligated at the same session, and ten days after the operation our patient walked about and could go home. He has now been well for over eleven years. The one important point in the operation is to ligate the carotid first and then afterwards the subclavian, because embolism occurs easily at the moment of ligation of the first artery, apparently due to the suddenly increased pressure, furthermore to the sudden change in the course of the blood-stream and of the whirls in the aneurysmatic sac.

As a last chapter, the neoplasms remain for discussion. The benign ones are much rarer than the malignant tumors. A few lipomas are described; they seem to have started underneath the ribs, and at least two of them, I find, grew outward through an intercostal space, and were thus recognized.

The chondromata, a very few in number, started from the chest wall. Only their later course of growth will decide their benign or malignant character.

Of fibromas Hoffmann found half a dozen, some of which belong to the older literature and are inexactly reported. I shall describe, further on, a case of fibroma with partly rather cellular areas. Dr. Bell, Professor of Pathology in the University of Minnesota, considers the tumor, however, a true fibroma.

Over one hundred dermoids have been reported. When still small, they are mostly situated behind the sternum. They develop laterally and grow more and more into the pleural cavity, where they may reach an enormous size, even to fill practically one whole pleural space.

Among the malignant neoplasms we find carcinomata, which take their origin mostly from the eso-

phagus, at times from carcinoma of the breast or from trachea or the bronchi. Sarcomas and lymphosarcomas are not so very infrequent. The sarcoma makes large nodular masses, generally prominent on one side of the mediastinum. The x-ray shadow has a rather rounded sharp outline, which according to Sauerbruch (Chirurgie der Brustorgane, 1920), is mainly or exclusively seen on one side of the mediastinal shadow. This is due to a principally expansive growth. The lymphosarcomata, on the other hand, with their exquisitely infitrating character, invade and permeate the neighboring organs rather than simply displace them. The lymphosarcomata form more diffuse neoplastic masses which show on both sides of the mediastinal shadow. Following the lymph channels they enter along the bronchi into the lung fields, where they produce a marked thickening of the shadow of the hilus with branching along the bronchi like in bronchial carcinoma. This ramification is dense and gives an almost mottled appearance. The malignant tumors of the mediastinum are operable only if unusually favorable circumstances are encountered. Burnham, of Johns Hopkins University (Jou. of the Am. Med. Ass'n., September 22, 1917), writes that, so far as he had been able to ascertain, there had never been a surgical cure of a malignant mediastinal tumor. I could not go through the whole literature of the subject, but found at least one successful case of a spindle-cell sarcoma reported in the Beitraege zur klinischen Chirurgie, 1901, p. 774, operated on by Marwedel in Czerny's clinic. The tumor was situated behind the sternum and was larger than a man's fist. It formed a sharply outlined mass, which could be cleanly removed after resection of the manubrium sterni and of short pieces of the first and second ribs. At the time of the report the patient was well two years and two months after the operation. Another case of sarcoma by the same operator, and reported at the same place, had grown into the mediastinum from its primary seat in the major pec-

toral muscle. Death followed one year after the operation.

For the present our only hope in nearly all of these cases lies in the Roentgen rays and more especially in radium. Very large doses of radium with sufficient filtering to remove all but the very hardest gamma-rays seem necessary, according to Burnham, who reports most remarkable results. He used only those radium rays which were left after filtering with 3mm. of lead. If the radium can be introduced into the tumor mass, smaller quantities may be sufficient.

Permit me to report a case in this connection:

On February 21, 1917, a gentleman, aged 26, consulted me for a mediastinal angiosarcoma. The clinical picture was typical. The patient was cyanosed. The face was puffed up, the eyes glassy, and the veins of the neck distended. Pain in the chest was complained of. A moderate but annoying dry cough existed; pulse, 125; temperature, 99.8°.

For many weeks the patient had not been able to sleep in bed or to lie down on account of his dyspnea. Over the upper part of the sternal region there was a bulging, which was soft to the touch like an angioma. The diameter was about 10cm. At the periphery one could see tortuous vein. On March 6 after some *x*-ray treatment we gave a few whiffs of ether with the patient in the sitting posture, tied the peripheral blood vessels off by interrupted circumferential sutures, made a vertical incision down to the sternum, inserted the radium (50 mg.) into the wound, and immediately packed and compressed. The tendency to bleed was fearful, but compression and some clamps stopped it. The radium was left in only seven hours. Four days later without an anesthetic we made a groove into the manubrium sterni with Luer's gouge bone shears. The bleeding forced us not to go farther. The radium was put into this sternal groove and left in for twenty-three hours. After this the patient felt easier, did not cough as much as before, and began to sleep at night.

On March 17, we went through the sternum and inserted the radium into the retrosternal tumor mass. The tendency to bleed was incomparably less than previously, especially than at the first incision. This time, and one week later, and again after another two weeks, the radium was

placed in the wound, each time for about forty-eight hours. In all, the patient had 8,600 milligram-hours. If we consider that this dose was given in the tumor, it is a very respectable dose and rather more than is usually given, for instance, in a carcinoma of the uterus. In addition we gave during that time (including two pre-operative treatments) five *x*-ray exposures (ten to fifteen minutes, hard tube, with 3mm. aluminum filter). Pain in the left shoulder was complained of for a while, but the general condition was greatly improved. The patient could sleep in his bed up to eight hours in the night. He went to the theatre, traveled to his home, and came back during the eight weeks he was under our care, and was most enthusiastic. Three months later, I was informed, he succumbed to what was declared pneumonia.

The principal stimulus for this paper was the following case of fibroma of the upper posterior mediastinum:

A cigar-maker, aged 43, a Russian Jew, was referred to me in December, 1919, for stomach trouble and pain in his chest. His history reads: The beginning of the present trouble dates back nine or ten years. He first noticed stinging pain in the heart area. Four or five years ago vomiting started. It occurred only at times, and stopped for two years, to come on again in the spring of 1919. The pain around the heart was the same as ten years before, no worse, not all the time. He can walk well, and does not get out of breath. His complaints are really quite moderate, and he had consulted his doctor for the stomach condition only. An *x*-ray of the chest was made on account of the stinging pain in the left side above the heart, and a tumor was found. The patient declares that since about a year ago his voice is not as strong as it was. It gives out quickly when talking. For certain reasons the patient could not take care of his condition at that time. But after pain had set in in the corresponding region on the dorsal side, and had remained constant for three months, he decided to accept the proposed operation.

The tumor was sharply outlined, did not pulsate, and showed no definite growth in the four months he was under observation. By a very competent rontgenologist the mass was declared to be probably a malignant tumor, and radium treatment was advised. We could not definitely decide between neoplasm and an intrathoracic struma, though the larynx seemed to move at deglutition. It was thought best to go in and see. If we could encounter an abnormally isolated intrathoracic goiters (a true struma

accessoria intrathoracica) or a walled off tumor, this was the only proper course to take. If, on the other hand, we had an inoperable malignant tumor, we could insert the radium into the interior, which would be of decided value.

On April 13, 1920, the operation was performed. A low collar incision was made on the neck. The sternohyoid and sternothyroid muscles were cut. The left sternocleidomastoid muscle is also divided in order to get sufficient room and freedom for action. The thyroid is laid bare and found not to be connected downward. A tumor can be felt in the depth. We first try to get near it directly behind the sternum, but soon find, after recognizing the subclavian and left innominate veins, that access was not to be had, and that further advance would lead to tearing the veins. The lower part of the common carotid is then lifted forward with a retractor. The mass appeared so hard, sessile, and fixed to the left side of the vertebral column that removal seemed doubtful. Some tortuous veins run across its upper pole.

With the idea of possibly reaching an area of safety and line of cleavage for enucleation, or, in case removal was impossible, an access for the introduction of radium into the center of the growth, we bluntly penetrate its most superficial fibrous layer with dissecting scissors. The region of the thoracic duct is avoided by keeping to the left of it. Positive pressure respiration, which had been prepared for, is now instituted by the aid of two intranasal tubes. The finger can then enter along the anterior surface of the tumor. After progressing about six cm. down on the tumor, the finger makes a rent in the pleura. Under the differential pressure the lung is ballooned, so that we can feel its soft, gently moving free border. It becomes necessary to get more room. A vertical incision over the sternum enlarges the wound downward. With a finger inserted directly behind the sternum for the protection of the innominate vein a narrow segment of bone is removed with gouge bone shears from the middle of the sternal notch down to the upper border of the second rib. With a sharp bone hook in the head of the clavicle the gap in the sternum can be spread to 2 cm., and the parts are better accessible. After introducing two fingers with considerable force and making use of the cleft in the sternum, the lower pole is felt to be free, while the principal fixation of the tumor is found to be at its upper posterior side. A couple of artery forceps, with one branch inserted into the tumor, give a good hold on it. The fibrous outer layers of the mass are cut between the clamps. The interior proves to

be partly yellowish broken-down material and partly solid tissue. By crawling down on the tumor alternately with two forceps and cutting between them the tumor is forced out. A promptly inserted large gauze packing stops the bleeding. Then, in order to obtain a hermetic closure of the pleural space, the cleft in the sternum is covered by a suture of the subcutaneous tissues, and the lower halves of the divided sternohyoid and sternothyroid muscles of the two sides are united in the midline. To make this suture air-tight the lower half of the divided left sternomastoid muscle is dissected free toward its lower attachment and fastened across. The skin is closed up to three small superficial drains. The pulse was good all through the operation, and is seventy at its termination. On the day after the operation a dullness was found over the left side from the angulus scapulæ down. This was probably blood and serum. It was left alone. Over the upper portions of the lung nice vesicular breathing could be heard. Recovery was prompt; the exudate cleared away rapidly; and sixteen days after operation the patient went home. An *x*-ray picture taken on October 20 gives clear lung fields.[1]

If I may add a few remarks on differential pressure, it can be said that it was not only helpful in procuring good and easy breathing, but that it was valuable in letting us recognize the amount of the bleeding. With a ballooned lung, which fills the pleural space, the blood shows better in the wound and keeps us informed of the bleeding at every moment and by every move. Not only is overpressure useful for these mentioned reasons, but it becomes indispensable and of prime importance when the possibility of injury to both pleural cavities exists, as in operations directly behind the sternum.

Our apparatus was the simplest possible, and for that reason was not likely to fail us in functioning. A Ben Morgan ether chamber, which happened to be the readiest simple outfit at hand, was connected with a good large bellows We might have used the nitrous oxide and oxygen bombs, and they were in fact at hand, but the bellows would not fail us and would not give out as a bomb will, and no disturbance

1. Fluoroscopic examination in August, 1921, again shows entirely clear lung fields.

and interruption by changing of bombs would have to be figured with. The ether chamber was connected by a long good-sized rubber tube with two intranasal tubes, which are to be inserted down to, but not beyond, the soft palate. Their openings, which are cut off on a slant, barely show behind the velum. Between the ether chamber and the intranasal tubes, which are connected by means of a forked glass tube, the long rubber tube is tapped by a T-shaped glass piece. The third arm of it is connected with a straight glass tube, about a foot long, which reaches into a high glass vessel filled with water. This serves as a manometer and as a safety valve. The glass tube was so

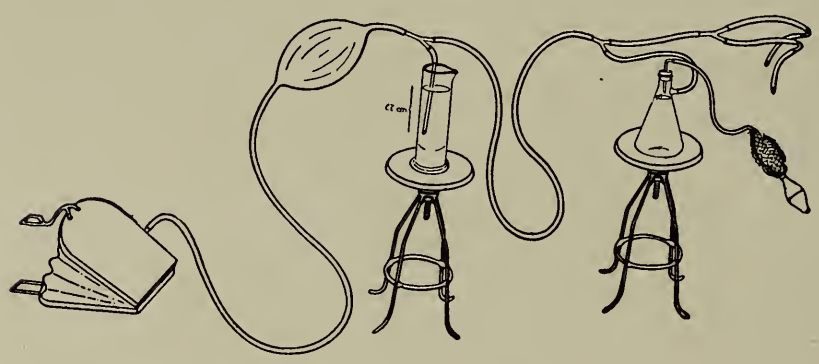

Fig. 4. Improvised differential pressure apparatus as used in the present case. A Ben Morgan ether apparatus was made use of.

fastened in our case, that it entered 22 or 23 cm. below the level of the water. This gave us approximately 17 mm. of mercury pressure, a pressure somewhat too high if the mouth is kept closed tight. An assistant was instructed to work the bellows just enough to produce a gentle bubbling in the water manometer, which assured the proper pressure and let the operator hear that everything worked well. The anesthetist could regulate the pressure by closing the patient's mouth more or less firmly with gauze. For obtaining a gentler and more evenly sustained pressure we had formerly prepared a wide connection with a soft rubber balloon of large size, which ought to be close to the patient. As so often happens with rubber goods, the

balloon having long lain idle, was spoiled. We got along quite well without it, though in a long operation it would be desirable. Instead of intranasal tubes one could use a well-fitted face-mask; but the pressure would not be so even and safe. The ether chamber is not an essential. Its place can be taken by some balloon or tank-like container, which steadies the pressure procured by the interrupted action of the bellows. The main tube is then tapped near the patient (as I had arranged it at a previous occasion) by a smaller tube entering from the side, through which ether vapors are pumped in according to need by the anesthetist. An electrically driven air-pump is of course easily

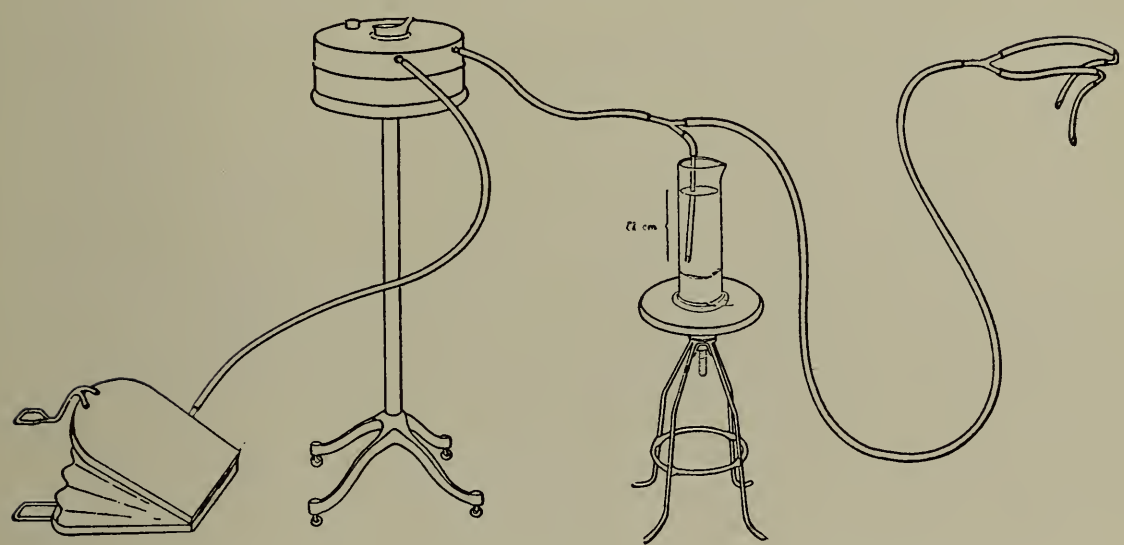

Fig. 5. Differential pressure apparatus as improvised at a previous occasion.

procured instead of the bellows. However, what I am particularly anxious to illustrate is the point that some sort of overpressure apparatus can readily be improvised. For the occasional operator in this field it is much more important to be ready to improvise some apparatus even if primitive, than to own a cumbersome outfit, which is stored away somewhere and may be out of order when needed. The difference in results between no apparatus and a primitive one is a good deal larger than between a primitive and an elaborate one.

In our case the differential pressure was not used long enough to produce the otherwise much dreaded shock. The narcosis was quite smooth, as is the rule in overpressure narcosis. Closure of the glottis does not occur or is at least counteracted. Vomiting is practically never seen. I can fully agree with Sauerbruch that local anesthesia (in its present form of development) in intrapleural operations is a capital mistake, because "forced and excited breathing, stoppage of respiration, and abnormally deep aspiration with all its disturbances and shock," are then very marked.

MOVABLE BODIES IN THE KNEE-JOINT

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For many years free osteocartilaginous joint-bodies have been of great interest to surgeons, and many efforts have been made to find the true cause and manner of growth of these troublesome bodies. There may still be some doubt in the etiology, yet the clinical features are definite, and the treatment is one, namely, surgical.

Hunter's pathology, regarding the life history of these completely detached and freely wandering bodies, may be faulty, yet coming from the latter part of the eighteenth century it is interesting. He maintained "that blood, when effused, tended to organize and to adapt itself to the tissue in which it was effused. Hence, loose bodies in the knee were organized blood-clots that became attached to the articular cartilage, assumed its character, and, later, becoming detached, gave rise to movable cartilaginous bodies.

The present well-accepted etiology of free joint-bodies, a piece of detached cartilage or of bone and cartilage,—must be attributed to Dr. George Rainey, of St. Thomas Hospital (1801-1804). He made the observation that detached loose bodies, like a cell of metastatic growth, may continue to grow in a new locality independent of the parent structure, though adhering to its character. Further studies definitely established that such free bodies are nourished by the lubricating joint-fluid (the synovia), similar to the bony growth which develops in myositis ossificans traumatica and receives its nourishment from the neighboring contiguous muscles.

While such osteocartilaginous bodies are found in all the other joints, they are more common in the larger hinge-joints, especially in the knee, where they are

often of traumatic origin, this joint being more subject to injury than any other joint due perhaps to its comparatively superficial location, between the two longest bones of the body, and the fact that the knee has a double function to perform—locomotion and bearing the whole body-weight from different angles for which nature has supplied it with a very elaborate ligamentous support. These ligaments are but slightly assisted by the muscles and the bones entering into the formation of this joint.

Therfore, we may say the frequent cause of derangement of this joint, injury of the ligaments and the semilunar cartilages, is due to the strenuous work it has to perform and to the peculiar motion of the joint, which is a combination of gliding and rolling. (Morris).

Though this joint belongs to the ginglymus, or hinge variety of diarthrosis, during extreme flexion it has to allow a certain amount of rotation of the tibia in its long axis, and a little abduction and rotation of the leg on the thigh. According to Henderson, "the maximum of these movements occurs in the arc between an angle of flexion of about 30° and an angle of flexion of 90°. This arc may be spoken of as the arc of weakness. It is in this arc of weakness that the majority of mechanical derangements of the knee are sustained." Direct trauma especially when the knee is in flexion may result in nipping some cartilage and bone from the condylar surface of the femur. Once detached, such osteocartilaginous bodies wander about and are nourished by the joint fluid and may grow to a considerable size.

A great many "joint-mice," as they are often termed, originate in the intra-articular cavity and may be a part of the semilunar fibrocartilages, which are two in number and are placed horizontally between the articular surfaces of the femur and the tibia. However, neither of them is sufficiently large to cover the whole of the tibial articular surface upon which it rests, so that when, during the peculiar rolling and gliding

movements of the joint, some undue pressure is brought upon the tibia it may cause the semilunar cartilage to become detached. Further, the upper and lower surfaces of both semilunar cartilages are smooth and free, and each cartilage terminates in an anterior and posterior fibrous horn, which may be clipped off and the detached bodies may become foci of such movable bodies. Villous projections into the joint may likewise be rubbed off, float about at will, and become engaged in the joint, resulting in its complete "locking," accompanied by severe pain.

The synovial membrane is also of special importance in this discussion because through injury, it probably becomes a frequent source of loose bodies in an otherwise healthy joint. Therefore, it will be well to recall some of its anatomical characteristics.

In the knee-joint the synovial membrane is not only the largest, but is the most elaborately arranged of its kind in the body, representing the fusion of three separate synovial membranes, which in some animals remain permanently distinct.

The portion of synovial membrane which extends from below the level of the patellar articular surface to the anterior part of the intercondyloid notch, lines the joint cavity, and forms a more or less extensive covering for the intracapsular ligaments and for the free surface of the infrapatillar pad of fat. At its femoral end it is narrow and attenuated, but at its patellar end it expands laterally to form wing-like fringes or membranes, which, through disease or infection and chronic irritation, may hypertrophy, become pedunculated, undergo proliferation by fibrous tissue formation, and be translated into calcareous formations. Through a sudden not necessarily violent movement of the joint, these osteocartilaginous fringes may be nipped off and give rise to loose-joint bodies.

Even the articular surface of the synovial membrane, through constant irritation, may become papillated, causing, instead of a smooth, a rough friction,

—a condition which will aggravate an already existing synovitis and bring about the thickening and hardening of the villi, or warty growths, which also may become liberated in the joint cavity. Such free bodies may become engaged in the articulations, also "locking" the joint. Further, during the act of "unlocking" they may be bruised and crushed. In this manner they may increase their number and keep up the vicious circle until surgical interference is sought. Thus synovitis and arthritis may be the result, as well as the cause, of loose bodies in the joint.

My associate, Dr. A. R. Robertson, who has been especially interested in the study of these bodies from the standpoint of pathology and etiology, made the following observation regarding the origin of "joint-mice," that in a chronically inflamed joint distended with fluid, the synovial membrane is stretched, thickened, and edematous. After a prolonged period certain areas of the thickened membrane might undergo an analogous translation into cartilage and bone. With subsidance of the fluid the membrane would be lax and flabby. In consequence the osteochondromatous areas would act as foreign bodies. Such areas would fail to accommodate themselves to the varying movements of the joint. In time they would become pedunculated and eventually pulled away to become now a detached free body within the joint. His belief is that there is no growth after they become fully detached.

It has been observed that certain individuals suffer from a condition known as "osteochondritis dissecans," when the surface of the knee-joint is especially brittle and some insignificant trauma causes the detachment of a portion of the articular surface.

The symptoms of this affliction are usually quite typical,—intermittent "locking" of the knee-joint, in the flexed position, which is accompanied by excruciating pain. During the act of "unlocking" the patient is conscious of something slipping out. The swelling in the joint that is apt to follow is due to injury to the tissues, and to consequent effusion of fluid into the

joint. It is quite possible, especially if the loose bodies are of considerable size and lodged in the extension of the joint upward (in the suprapatellar pouch) that they may hinder locomotion slightly as there is less likelihood of such large bodies, owing to their thickness, gliding into and becoming engaged in the joint. Especially is this true if the edges of the bodies are more or less rounded and spherical in shape. Quite often the movable bodies in the knee can be easily palpated by flexing and extending the knee-joint, especially when they are located in the suprapatellar pouch.

If with the history of "locking" and with well-pronounced characteristic symptoms, there are to be felt dense bodies which can be moved from place to place, the diagnosis is not difficult. Often they are found and isolated by the patient. Sometimes the history of the mode of production is helpful. It is well to bear in mind that symptoms of nipping of a synovial fringe are not as pronounced and the pain is not as acute in its primary occurrence.

To make a positive diagnosis, to the clinical evidence must be added the *x*-ray pictures, but merely as a corroborative agent. The *x*-ray examination generally is a great aid in detecting any such bodies in the knee, and stereoscopic observations are especially useful in definitely locating their relative position in the joint.

A few guides to the accurate reading of such *x*-ray plates:

The picture of osteocartilaginous loose bodies is quite characteristic, as they present themselves as well-defined, uniform shadows of individual structures.

Dislocated semilunar cartilage will not give any *x*-ray evidence, except when incrustated.

Degenerated fat pads, due to chronic disease, such as tuberculosis and syphillis, may be palpated, but the *x*-ray will not reveal them.

A sesamoid bone in the internal head of the gastrocnemius in certain positions may cast a shadow which can be mistaken for a loose-body.

Joint lipomata may cause "locking," may be even felt, but will not have the characteristic picture of "joint-mice."

The attending physician's first duty is to relieve pain and "locking" and establish motion. With manipulation, forced flexion, and sudden extension, the offending loose-body may usually be dislodged. Surgery only will give lasting relief.

If the presence of "joint-mice" is associated with arthritis deformans, and the joint is already considerably impaired, the removal of the loose bodies will be of little benefit. It is well to bear in mind that surgery does not cure the causative lesion and therefore similar bodies may reform.

If the treatment, as in most cases, is to be surgical, during operation the joint should be subjected to as little trauma as possible, and more than the ordinary care should be taken to guard against infection.

The method of approach in each case must be decided in accordance with the requirements in each individual case, depending on the location of the "joint-mice." If the complete exposure of the joint is required, the longitudinal division of the patella may be imperative. But this procedure naturally entails more injury to the joint than the safer longitudinal incision of the external surface of the joint. The diagonal incision following the internal line of the joint is preferable for the removal of the internal semilunar cartilage and other free bodies within the joint.

To prevent ankylosis mobilization of the knee should begin as early as possible.

The biology and the gross appearance of such joint-bodies are remarkably constant. In shape they are generally planoconvex or concavoconvex; the latter

aspect being perfectly smooth, while the plain or concave surface is uneven, roughened, or nodulated. They may not always be found free, but may be found fixed in a fossa or excavation in the articular surface of a femoral condyle; or they may be found in close relation to the crucial ligaments in the intercondylar space. On rare occasions they are pressed between the bones, and lie snugly imbedded in a fossa in the articular cartilages.

It is known that denuded and injured articular surfaces of bones in time become covered over by smooth, white hyaline, articular cartilage. This is true of "joint-mice" as well. When carefully examined they will be found to be covered with a thick shining white layer of hyaline cartilage. Sometimes on the smaller concave side may be found a thin layer of true spongy bone, especially when the removal takes place soon after the injury. Undoubtedly, the appearance, shape, and biological contents of specimens depend primarily on their origin, evolution, and growth.

I wish to present, briefly, one case which, in my experience, is unique because of the size and number of bodies present and the comparative slight disability the patient suffered. Had I followed the apparent *x*-ray findings in this case, the joint would have been unnecessarily subjected to additional trauma by a third incision for the seventh loose body. But it proved to be the peculiar shadow of the sesamoid bone, which photographed from a certain angle gives an identical picture of "joint-mice."

T. J. M., male, aged 26, truck driver. In 1912 when playing baseball he accidentally twisted his right knee One year later he injured it again when a heavy weight fell on it.

Since the first accident he has experienced about twice a month intermittent "locking" of the knee in a flexed position at an angle of about 45,° accompanied by severe pain. With great effort the leg was straightened. Each time the patient was conscious of something slipping in the joint, and then be was relieved of pain and "locking." This condition was followed by more or less swelling of

the joint. There has been a constant moderate swelling since the first injury; otherwise he is in robust health and shows more than the average muscular development. He was prevented from attending to his work only twice during the history of his trouble and then only for two or three days.

A Wassermann test was negative. The other joints are in normal condition. The right knee is moderately swollen, and several loose bodies can be palpated. X-ray examination revealed what appeared to be seven loose bodies in the joint, one between the articulating surfaces of the joint.

Operation June 9, 1919. Removed six osteocartilaginous bodies from the right knee-joint, ranging in size from one and one-quarter inch in diameter to one-half inch thickness, to the size of a small almond, one of which was attached to the joint surface by a fibrous band and located between the articulating surfaces. This one was removed through an incision about two and one-half inches long, following the line of the joint internally. The other five were removed by longitudinal incision external to the joint. The irregular anterior surface of the tibia indicated this area as the possible origin of these loose bodies.

Pathological report:—The surface of specimens is of glistening whiteness, is everywhere pitted so that it presents numerous bosses. In some there appears to be a large depression to which a little connective tissue is attached, possibly the remains of a pedicle.

Microscopic section show a surface of dead connective tissue beneath which this tissue shows gradual change to hyaline cartilage, the fibrocartilage, and then a beginning calcification of the intestitial hyaline substance. In places, the cells undergo re-arrangement into columns, and true bone is formed.

The patient made a good recovery and has had no trouble since the operation. A recent x-ray indicates no recurrence.

DISCUSSION

Dr. Melvin S. Henderson (Rochester, Minn.): The chief point of interest in Dr. Lamson's paper to me is, that the loose bodies in his case do not seem to have their origin from the internal condyle of the femur, but from the tibia. This is very unusual, and the only instance that I know of such an or-

igin of the body being demonstrable. Loose bodies in the knee-joint are formed in various ways, and it is the study of their etiology that is particularly interesting. In certain individuals the bodies arise from the internal condyle of the femur, and we recognize this group as a definite clinical entity, giving it the name of osteochondritis dissecans. Marginal osteophytic growths found in hypertrophic arthritis break off, wander about the joint, and nourished by the joint fluid, increase in size, forming often many loose bodies. The *x*-ray often clearly shows the layers of cartilage and bone deposited. In still another group the bodies may be very considerable in number and on opening the joint it is perfectly clear that the bodies originate in the synovial membrane. This conditions is "called osteochondromatosis." Dr. Lamson has opened up a very interesting question. The condition is eminently a surgical one as the only relief is through surgery.

Dr. John P. Lord (Omaha, Neb.): I think we are indebted to Dr. Lamson for the complete presentation of this subject. Of course, these knees are of great interest to all of us. I have had a good many cases, yet I have not had an enormous number. I wish to speak of one experience which I have had which I think would be of interest from different angles.

A man, thirty years of age, presented himself to me fifteen years ago with one of these knees. The history was of repeated locking, and the symptoms were acute, so that the patient was laid up and disabled most of the time. I had seen several stiff knees following operations for the removal of loose bodies by operators who had worked through inadequate incisions, spent much futile effort, and had infection follow. I therefore, thought it better to make a free attack upon the joint than to undertake to make multiple incisions. A free, transverse section was made, including the patella, and I clipped off some of these bodies which were attached anteriorly. The free access afforded by the ample exposure permitted the removal of the bodies in the condylar pouches.

The largest of these bodies was one and three-quarters of an inch in diameter, and was doubtless formed by a section of the joint becoming detached. It reminded me of a sunburst pearl brooch. All of these bodies were similar to this. This man made a good recovery and quickly returned to work, and had the use of this joint. He presented himself three months ago with but five degrees less than a full range of motion.

Dr. St. Elmo M. Sala (Rock Island, Ills.): I reported a case similar to Dr. Lamson's several years ago, either in this

Association or in the Illinois State Medical Society, in which there were five loose bodies in the knee-joint. They were removed by open operation, and the knee-joint put at rest for six weeks with perfect restoration of joint.

Dr. Harry P. Ritchie (St. Paul, Minn.): There is one feature which it might be well to bring out, which corresponds to the pictures that Dr. Lamson shows. I am personally acquainted with four cases in which it has been demonstrated before these bodies have been separated off. I observed a friend who came with a complaint of a floating body in the joint, and was under observation for several years. Two or three years after this body had separated, we opened it up, and removed the body. In two cases following, we observed this same thing and attacked the joint before the body separated. However, most of the loose bodies that I am familiar with have been demonstrated on the femur, but Dr. Lamson shows those on the tibia.

HABITUAL OR RECURRENT DISLOCATION OF THE SHOULDER

M. S. Henderson, M. D., F. A. C. S

ROCHESTER, MINNESOTA

The literature on the subject of habitual dislocation of the shoulder is characterized by the absence of definite reports on end-results. This communication is primarily a report of nineteen patients operated on in the Section on Orthopedics of the Mayo Clinic for recurrent dislocation of the shoulder. Twenty-six patients have been observed, twenty-three before January 1, 1920.

That dislocation of the shoulder is not more common demonstrates how wonderful are mechanism and muscle balance that prevent such an occurrence; this is all the more remarkable when one considers the poor bony formation of the joint from the view-point of mechanics.

Almost invariably there is a severe injury at the time of the primary dislocation followed by a normal convalescence, but the second and subsequent dislocations usually are not accompanied by any trauma or severe muscle strain. There is no way of finding out what percentage of persons who have had dislocations of the shoulder become sufferers from habitual dislocations.

If there is any way of preventing recurrence of the dislocations the means should be known and used. Following the primary dislocation the arm should be held to the side for three weeks and no abduction permitted for at least five weeks. Some stiffness may

result, but this can be overcome by massage and use, or, if necessary, by manipulating under an anesthetic.

The movements producing habitual dislocations are abductions and a slightly forward motion, the arm being in the position assumed when a person reaches for something on a shelf slightly above the level of the shoulder. I am convinced that some altered muscle tension has to do with the production of the dislocation. This lack of muscle tone may be caused by an alteration in the relationship of a muscle to its original insertion; for example, it has been claimed by many that the relationship of the supraspinatus and the infraspinatus to their insertion is altered by their being partially torn off at the time of the original injury. It may then be assumed that at least a part of their supporting action is lost because of a lengthening of their tendinous insertion. Lovett has drawn attention to the fact that he has noted an abnormally large space between the head of the humerus and the acromion process and that the shoulder is apparently lower, and he has inferred from this that the shoulder capsule was relaxed. In only two cases, one a patient with a posterior dislocation and the other an epileptic, have I been able to produce a dislocation when the patient was on the operating table anesthized and thoroughly relaxed. It is probable that in others by vigorous manipulation I might have thrown the shoulder out, but it must be remembered that recurring dislocations are not produced by violent trauma. My efforts, however, were quite sufficient to convince me that the dislocations seldom are due to any primary fault in the structure of the head or the glenoid fossa, but that they are produced by the action of certain muscles whereby the head of the bone is thrust against a weakened portion of the capsule. No doubt structural changes are found in persons who have had a great many dislocations, as in epileptics, but I believe the

changes in such instances are the result and not the cause of the dislocations. In a previous paper on this subject I have more fully considered the anatomical structures of the shoulder-joint.[7] Thomas, Reviére, Clairmont, Eden, Finsterer, Joseph, Ricard, Gerster, Young, Burrell and Lovett, and others have written excellent articles on habitual or recurrent dislocation of the shoulder.

The factors essential to the easy recurrence of a dislocation, I believe, are these: The primary dislocation causes a tear in the anterior inferior portion of the capsule, which is the weakest and most lax region. This area is not supported by the tendinous insertion of muscles, since the subscapularis is above and the few fibres of the triceps that have their origin from the glenoid margin are below. The supraspinatus and infraspinatus tendons may be torn at the first luxation and as true tendon is always replaced by scar tissue the repaired tendons may stretch. The insertion of these muscles may actually be torn off, resulting in relaxation and loss of tone of the muscles, which permit the head of the bone to drop a trifle lower than its normal position. In not a few cases of fresh dislocations which I have seen the greater tuberosity was torn off. When the arm is in the position in which most of the dislocations occur, namely, abduction above the level of the glenoid fossa and slightly forward, the condition of the muscles and the direction of their pull are as follows:

The suspraspinatus and infraspinatus have not their normal tension and thus allow the head of the bone to be a little lower than normal. The teres major, the latissimus dorsi, and the pectoralis major tend to pull the head into the glenoid fossa, but they also tend to pull the head downward and forward. The supporting action of the subscapularis is gone because the slightly abnormal low position of the head of the

bone puts the muscle across the upper half of the head of the bone leaving the lower half unsupported. The head is thus thrust against the weak place in the capsule below the subscapularis and as the powerful latissimus dorsi, teres major, and pectoralis major contract, the head slips over the edge of the glenoid margin, bulges out the capsule, and glides up, usually to form a subcoracoid dislocation. (Figs. 1 and 2.)

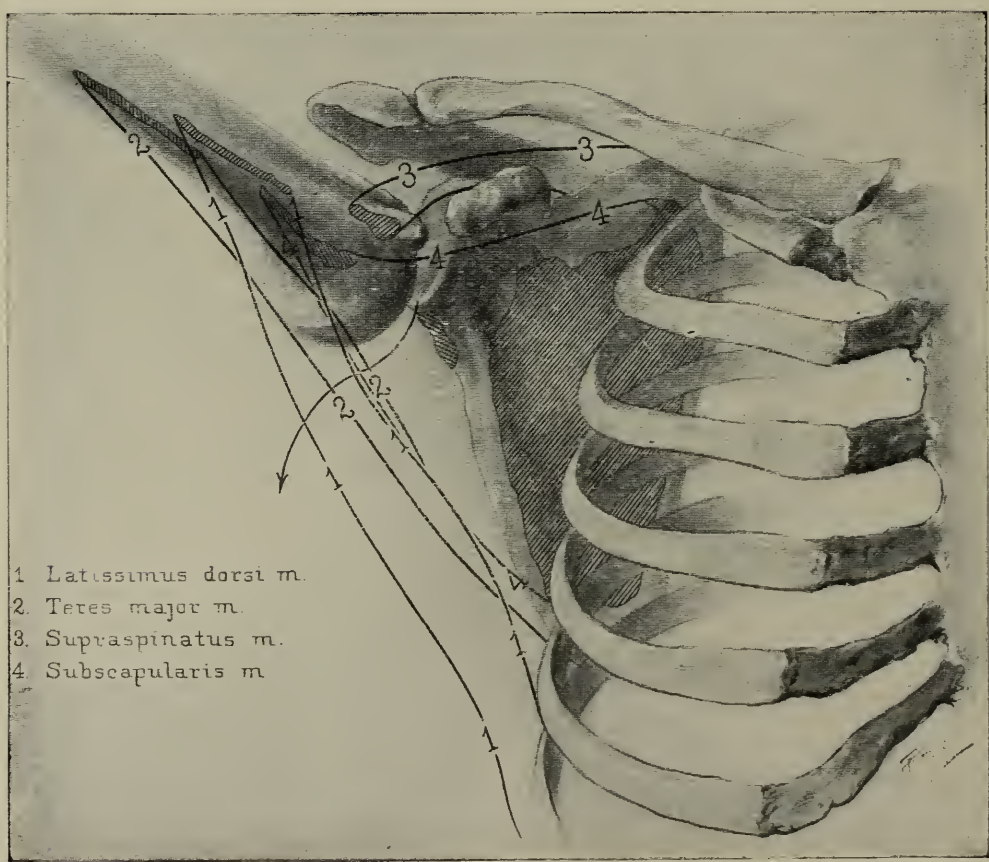

Fig. 1. Anterior view of shoulder-joint with origin and attachment of muscles concerned in the dislocation.

In the group of 23 cases the average age of the patient was 28 years; 20 were males and 3 were females. The dislocations were equally divided on the right and left sides. Trauma was mentioned as the initial cause in all. Two patients were epileptics. Nineteen patients were operated on; three of the operations, however,

are too recent to be of great value in estimating results. In the 16 cases, however, we may reasonably discuss the results attained by surgery.

Capsulorrhaphy was the type of operation used to prevent the dislocations. (Fig. 3.) The weak point in the capsule is in the anterior inferior portion, and this must be strengthened. The manner of approach is immaterial. We have used an incision along the axillary anterior border, carefully avoiding, on deep-

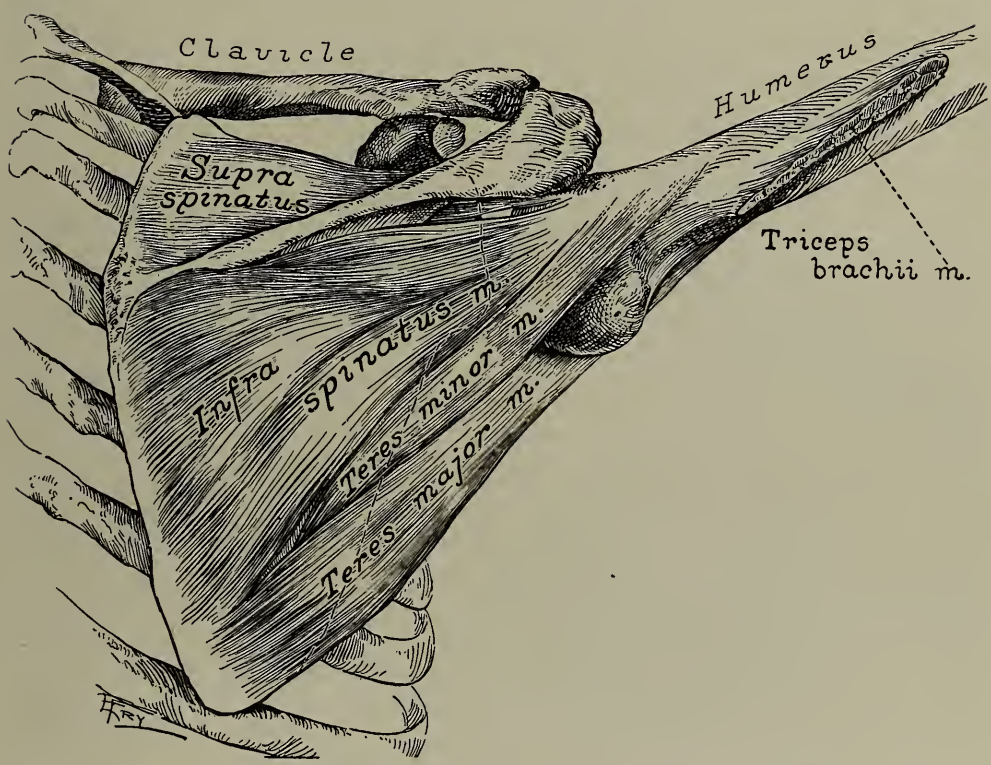

Fig. 2. Positions of Muscles on posterior surface of scapula. Capsule of joints is not shown.

er dissection, the circumflex vessels and nerves. Besides the capsulorrhaphy in a certain number of cases we have lengthened the pectoralis major, a procedure that has been advocated by Young, because we believed that this muscle had something to do in the production of the luxation.

I have classified as cures only those cases in which there have been no recurrences. One group is in

reality worthy of being classified as decidedly improved, and another as improved since fewer dislocations occurred than before operation and the patients are well satisfied. Some operations are clearly failures: the condition is as bad perhaps worse than before operation. In some instances this is undoubtedly due to faulty operative technic as occasionally the approach to the capsule of the joint is difficult, and the field discolored with blood, particularly in muscular persons.

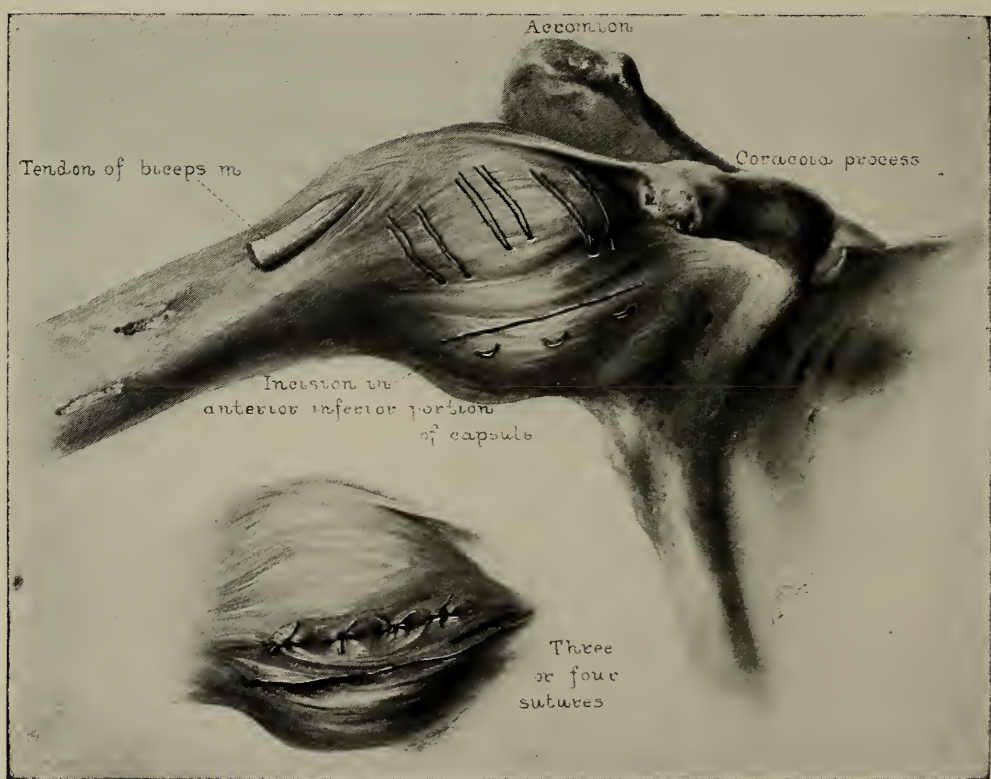

Fig. 3. Capsulorrhaphy overlapping with four doubled chromic catgut sutures. The principle of the Mayo repair of abdominal hernia is followed in this operation.

From the group of 8 cases which I reported in 1917[8], 2 patients (Cases 3 and 4) report that they have had dislocations, the former six years and eleven months after operation, and the latter five years and eight months after. They are both, however, decidely better than they were before the operation. These

cases illustrate the difficulty of determining whether or not a patient is to remain free of his luxations.

In Table I the percentages of cures, and the percentages of improvement in the 16 cases, are tabulated, showing on the whole very satisfactory results. It is quite probable that our cures in this series will in time be reduced, for all cases operated on one year or more have been included. Table II shows the percentages in cases in which operations have been done more than three years (Tables I and II).

TABLE I.—HABITUAL DISLOCATION OF THE SHOULDER

		Per cent
Patients observed	23	.....
Patients operated on	19	.....
Patients operated on previous to January 1, 1920	16	.....
Patients concerning whom information has been received	16	.....
Patients cured	8	50
Patient decidedly improved	5	31.25
Patients cured and decidedly improved	13	81.25
Patients on whom operation failed	3	18.75
TABLE II.—PATIENTS OPERATED ON MORE THAN THREE YEARS	8	.....
Patients cured	3	37.5
Patients decidedly improved	4	50
Patients cured and decidedly improved	7	87.5
Patients on whom operation failed	1	12.5

Two patients had one dislocation six years, eleven months, and five years, eight months, respectively, after operation.

REPORT OF CASES

Case 1 (66183).—Mr. W. C., a laborer, aged 24, came to the Clinic for examination April, 1912. Six years before he had dislocated his shoulder, and the dislocation had not been reduced for thirty-six hours. After that there had been multiple dislocations, not prevented by apparatus. Capsulorrhaphy was performed April, 1912, and there were no dislocations until November, 1913. January, 1914, the Young operation was performed. The man has since had dislocations, and the case must be called a failure.

Case 2 (87419).—Mr. H. W., a laborer, aged 25, came for examination July, 1913. Five years before his left shoulder had been dislocated in a runaway accident. Later he had had seven dislocations and was incapacitated for a month after each. There had been an interval of two years between the last two dislocations, the latest one occuring in June, 1913. Capsulorrhaphy was performed July, 1913, and in a communication from the patient, August, 1917, he stated that he had had no further trouble and was doing everything he wished to do with his arm. In a letter, October, 1920, he states that the arm is normal. This patient is evidently cured.

Case 3 (90312).—Mr. L. L., clerk aged 19, was first examined at the Clinic, August, 1913. Eighteen months before the shoulder had been dislocated while he was playing hockey. During the 18 months the dislocation occurred probably a dozen times, the last time while he was swimming. Capsulorrhaphy was performed August, 1913. The patient's mother in a communication, September, 1917, stated that the arm was left somewhat weak, but that no dislocations had occurred. In July, 1920, six years and eleven months after operation, the patient dove, with his arms in the usual position. The shoulder dislocated on striking the water. This is the only dislocation since the operation. We may safely class this patient as decidedly improved.

Case 4 (107485.—Mr. M. G., a merchant aged 41, was examined June, 1914. Nineteen years before he had fallen and dislocated his right shoulder. It was reduced immediately. There were several dislocations during the next four years, and then he "caught a cold, which seemed to settle in the right shoulder." For four months soreness prevented his lifting the arm to the head. After that he had numerous dislocations. Ten years before the examination he fell and, in catching himself, dislocated the left shoulder. The left shoulder, however, had not been dislocated for the last two years, and we consider the dislocation merely the result of an ordinary trauma. The right shoulder was out of joint repeatedly, the last dislocation being three weeks before the examination. Capsulorrhaphy was performed June, 1914. In a communication, August, 1917, the patient asserted that he had no further trouble and that he was getting along nicely. In February, 1920, five years and eight months after the operation, the patient dislocated his right shoulder, although he was not exerting it unusually. There have been no further dislocations

up to October 8, 1920. This patient may be classed as being decidedly improved.

Case 5 (118613).—Mr. V. A., a bookkeeper, aged 33, was examined November, 1914. After a dislocation of the left shoulder seven years before he had had recurring dislocations, at least 12 a year. He sometimes threw the shoulder out of the joint in reaching for something on a shelf. November, 1914, capsulorrhaphy was performed. The patient was not troubled until May, 1915, when he had a peculiar feeling that his shoulder was going to slip out of joint. In September, 1917, he reported that during the last year the shoulder had slipped out twice. The patient last reported September 29, 1920; he states that he considers himself greatly improved as he has had only three or four dislocations up to April, 1920, and none since that date, and he feels that his shoulder is getting stronger. I record this case as decidedly benefited by the operation.

Case 6 (123803).—Mr. S. F. L., a lawyer, aged 25, was examined February, 1915. Eight years before he had dislocated his shoulder while playing foot-ball. It was dislocated the next time while he was swimming, the third time while he was playing baseball, and since it had even slipped out while he was sleeping. At the time of the examination, he was wearing a band around the body to hold the arm to his side. He had worn it steadily for a year and a half, thus averting dislocations. Capsulorrhaphy was performed February, 1915. The patient wrote from an officer's training camp, August, 1917, that he had been able to do his bit in such strenuous tests as digging trenches, bayonet exercises, and trench storming without suffering the slightest inconvenience or trouble from the shoulder. A letter dated October 16, 1920, records that he had no further trouble. He is classed as cured.

Case. 7 (156847).—Mr. J. C. S., a merchant, aged 30, was examined April, 1916. Ten years before he had dislocated his shoulder. The dislocation remained for two days, and then reduced itself, which suggests that it was subglenoid dislocation. The shoulder was later dislocated many times, and the patient had to take gas, ether, or chloroform about ten times for reduction. In April, 1916, the Young operation was performed. In a letter dated August, 1917, the patient declared that he had had no further trouble and that this shoulder seemed to be as strong as the other. His last communication was written April, 1920; he stated that during

sleep two and half years after the operation he had had a dislocation which required an anesthetic for reduction. This patient cannot be classed as cured, but he is decidedly improved.

Case 8 (200995).—Miss H. J., a nurse, aged 33, was examined July, 1917. Thanksgiving day, 1915 she fell and dislocated her shoulder. It was reduced about an hour later, and was held to the side for ten days. The next dislocation occurred Christmas day, 1916, and four dislocations later. Capsulorrhaphy was performed, July, 1917. The patient states that up to the time of the writing, October, 1920, she had no recurrence. She is classed as cured.

Case 9 (233633). Mr. C. O. M., a teacher, age 46, came to the Clinic for an examination June 4, 1918. Fourteen years before he fell on the left shoulder and dislocated it. He thought he had had at least thirty dislocations, three in the last nine months. A pull on the shoulder reduced the dislocation so that it was not necessary to call medical aid. Operation, June 11, 1918, consisted of capsulorrhaphy and lengthening the tendon of the pectoralis major. A little more than a year after the operation dislocation occurred twice in one month. The patient wrote October 8, 1920, that the shoulder has been out of joint many times and that he is coming back for observation and advice. This operation evidently was a frank failure.

Case 10 (236286).—Mr. E. B., aged 20, who was examined June 24, 1918, is subjected to epilepsy; the attacks occur about once a month. For six years he was in a hospital for the insane. During an epileptic seizure, six months before our examination he fell against a radiator and dislocated the right shoulder. Later it dislocated during seizures or some trival act such as throwing a stone or sneezing. June 29, 1918, a capsulorrhaphy was performed. Three months after the operation the right shoulder was again dislocated. A letter written September 18, 1920, by the superintendent of the State School for the Feeble Minded, where the man is an inmate, states that now both shoulders dislocate during the epileptic attacks. The operation in this case must be classed as a failure.

Case 11 (196886).—Mr. E. P. H., a billiard room marker, aged 37, was examined July 1, 1918. Ten years before he had been in a railroad wreck, and the left shoulder had been dislocated. He reduced it himself by taking hold of a board

and pulling hard. The shoulder reduced with a snap. The patient stated that he had had about eight dislocations in all. He insisted that the dislocation was always backward and posteriorly. July 6, 1918, when the patient was prepared for operation and thoroughly relaxed under the anesthetic, I dislocated the shoulder posteriorly. Accordingly a posterior incision was made through the supraspinatus muscle, the capsule was opened and overlapped, as was also the muscle. A report from the patient, April 2, 1920, states that he has had no more dislocations, but that he has an insecure feeling. Up to date he may be called cured.

Case 12 (243697).—Miss M. C., aged 19, was examined August 27, 1918. Four years before the right shoulder had been dislocated; 1 year later it was dislocated during a basket-ball game, and the same accident occurred once a year for two years, and then quite often. Capsulorrhaphy was performed September 13, 1918. The patient had had no further dislocations when last heard from in April, 1920, and may therefore be classed as cured.

Case 13 (246611).—Mr. G. W., aged 41 a contractor, was examined September 24, 1918. The patient came for consultation primarily because of recurring, double, direct, inguinal hernias. The record, unfortunately, merely states that the patient had recurrent dislocations of the left shoulder for which a capsulorrhaphy was performed October 24, 1918. In a recent letter, dated October 16, 1920, the patient reported that he had no further dislocations. He may be classed as cured.

Case 14 (246884).—Mr. G. M., aged 23, a farmer, examined September 26, 1918, had dislocated his right shoulder two years before. Six months later luxation occurred again, and during the last year it had occurred seven or eight times. October 10, 1918, a capsulorrhaphy was performed on the right shoulder. In a letter written during April, 1920, he states that he had a severe fall eleven months after the operation. which dislocated the shoulder, but he believed that the fall was sufficient to cause a normal shoulder to be dislocated. He may therefore be classed as decidely improved.

Case 15 (289163).—Mr. W. L., aged 35, who was examined September 13, 1919, had had epilepsy since he was fifteen, but came to the Clinic for the purpose of having the right shoulder fixed, if possible, so that it would not dislocate so easily. Four years before the examination the first luxation had

occurred, and there had been about fifteen since. Capsulorrhaphy was performed September 22, 1919. A letter received in October, 1920, states that there has been no dislocation. Although the time is short this patient may thus far be called cured.

Case 16 (274650).—Mr. F. F., aged 29, was examined December 12, 1919, because of a dislocating right shoulder. The first dislocation was sustained during a wrestling bout; six or seven had occurred since, in one instance when he was swimming and in one when he sneezed. December 16, 1919, the usual capsulorrhaphy was performed, except that an attempt was made to include more tissue in the overlapping, and two strands of silk were used. The operation was made more difficult than usual by the greater amount of hemorrhage, and the patient was quite muscular, so that exposure was difficult. A numbness of the right hand followed the operation; this gradually improved. February 4, 1920, a neurologic examination by Dr. Sheldon and Dr. Woltmann showed an irregular distribution of sensation, and they believed that the condition was merely a traumatic neuritis of the brachial plexus and that no nerve or nerves could be singled out as being involved. This is the only case in our series in which trauma was inflicted on the nerves and the only explanation I can offer is that in some way our efforts in retracting to obtain exposure were too vigorous. A letter from the patient during September, 1920, states that he has had no trouble with the shoulder except a feeling of weakness, but his hand is still numb in the little and ring fingers, and the power in these fingers is weak. Evidently the ulnar nerve is involved. It may be said for the present that he is cured.

Case 17 (309320).—Mr. M. R., aged 22, was examined March 17, 1920. Three years before in jumping over a fence and holding the arms abducted, as one does in jumping over an obstacle, the right shoulder dislocated. The dislocation occurred twice afterward, the last when he jumped from a bobsled two weeks before our examination. This case is of interest, since in so far as we could learn, there had been no primary severe trauma, such as had occurred in the other cases. March 23, 1920, capsulorrhaphy was performed, and the pectoralis major was lengthened. The case is too recent to include in reporting results.

Case 18 (320106).—Mr. E. H. N., aged 22, examined June 16, 1920, while playing football in September, 1914 had disloc-

ated his left shoulder. One month later while again playing football the joint luxated. Following this the patient had seven dislocations, one while swimming, and one while in bed after a fifteen months' interval. June 18, 1920, a capsulorrhaphy was performed; the sheaths of the teres major and of the pectoralis major were lengthened. The operation is too recent from which to judge ultimate results.

Case 19 (326010).—Mr. G. C. P., aged 36, was examined February 22, 1920. This patient had had epilepsy for eight years, but the first dislocation of the left shoulder occurred five months before our examination. A second dislocation had occurred six weeks before during a seizure. Unfortunately the doctor in reducing it broke the surgical neck of the humerus. An open operation was performed and good position was secured, but during an epileptic attack (attacks usually came on during sleep) the shoulder luxated. When we saw him the position of the fracture was so poor and the dislocation had been present so long that my colleague, Dr. Meyerding, excised the head. We have not heard from the patient since his dismissal August 24, 1920, but at that time function promised to be good.

CONCLUSIONS

1. Capsulorrhaphy to strengthen the shoulder gave 50 per cent cures in the 16 cases of habitual or recurrent dislocation of the shoulder. Five (31.25 per cent) of the patients are so decidedly improved that they are more than satisfied with the operation. This percentage of improvement and the percentages of cures give good results in 81.25 per cent.

2. It is probable that muscle pull or possible relaxation of the shoulder capsule above has not been sufficiently considered in the treatment. It is reasonable to suggest, therefore, that the pectoralis major, teres major, and latissimus daris be lengthened and if thought necessary, the region of the capsule where the supraspinatus and infraspinatus are inserted and the anterior inferior portion of the capsule be reefed.

I wish to thank Dr. H. T. Jones, assistant in the Section on Orthopedic Surgery of the Mayo Clinic, for his assistance in looking up the literature and in tracing the patients.

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DISCUSSION

Dr. A. F. Jonas (Omaha, Neb.): There is one type of dislocation met with very infrequently. Last June, a gentleman of 67, who had been in a railroad wreck was referred to me. He had a right shoulder dislocation. He was sent to Denver first, and had, at that time, a very marked effusion in th shoulder-joint and abrasion. I saw him six days after the original injury. He had considerable amount of fluid in the joint. At the end of two and one-half weeks I noticed a luxation of that joint and a beginning atrophy of the deltoid muscle. This continued and massage was begun. It is one of the very rare types of cases in which you see a subclavicular dislocation due to circumflex nerve with resulting atrophy and marked arteriosclerosis.

REMOVAL OF VENTRAL TUMORS OF THE SACRUM BY THE POSTERIOR ROUTE

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Ventral tumors of the sacrum first described and brought into surgical literature by Middledorph[1] form an interesting group. The name "Middledorph tumors" clings to them, although Law's name of "ventral tumors" of the sacrum is perhaps better nomenclature.

These tumors interest the operating surgeon through the oddity of their origin and placement, the difficulty of their removal, and their dangerous habits of rapid growth and greedy encroachment upon bladder, bowel, and ureter. They interest and puzzle the pathologist by the varied character of their cell formation and by the structural anomalies they present. The confusion of the amateur pathologist who attempts their study is only exceeded by the confusion of the amateur operator who attempts their removal. Both will have occasion to wish themselves well out of the case.

In 1912 Law,[2] of Minneapolis, read before this society an article entitled "Ventral Tumors of the Sacrum" in which he gave a clear account of the origin and development of these tumors and their minute as well as gross anatomy. Their origin seems well established. Embryonic remains they surely are. Their many-sided pathology; the variation in their microscopic structure; the confusing reports from laboratories as to their classification; and varying cytology of these tumors, may be well accounted for by extensive development which normally and anatomically grows from the wolffian bodies, and it is from

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1. Middledorph: Arch. f. Path. Anat., etc., Berl., 185, vi, 37
2. Tr. West. Surg. Ass'n., 1912.

these wolffian bodies with their embryonic cycles of origin, function, degeneration, and quiescent persistence that these tumors oftenest spring. They lie in the region wherein the embryo the neural canal differentiates itself from the intestinal canal and where the wolffian body becomes the renal system, and the wolffian duct becomes the vas deferens in the male, and degenerates in the female. It is here in the adult that bladder, ureter, bowel, and vas are contiguous. The tumors lie ventral to the cup-shaped cavity of the sacrum. They shove their bulk forward and can be felt above the pubic bone, and when large may be seen there. They thus invite attack by ventral incision, and the literature shows cases that have gone on to serious, even fatal condition, owing to the destruction of tissue, the difficulty of controlling hemorrhage, and the infection of the operative field incident to an operation that traversed the peritoneum to reach the seat of dissection and excision; yet the dorsal position for the operative case is such a common one that unless carefully instructed a house service is apt to present such a case prepared for ventral section. An added invitation to suprapubic attack is the error in diagnosis that so often records tumors as intraperitoneal, ovarian, parovarian, or uterine. When such an attempt is made and the abdomen is opened in front in the lower middle line an operator who has not attempted such a task before is inclined to go on and shell out the tumor, which he finds behind the pelvic viscera. He is working deeply and the control of hemorrhage is difficult. As he progresses his difficulties increase. Realizing perhaps the futility of completing the removal of such a growth from a suprapubic incision the surgeon may supplement it with an attack by the perineal route only to be balked by the bowel and ureter pushed down by the growth. There remains the attack by the sacral incision. While a posterior incision and a sacral resection is an ideal way to reach these growths, it is practically impossible to do it supplementary to an abdominal incision. Rules of technic are outraged.

It is the purpose of this paper to call attention briefly to these tumors and the reasons for their removal by the posterior route. Kocher, in 1874, and many writters since his time have invaded the pelvis, at least the posterior-inferior pelvis by way of the sacrum, but Kraske, of Freiburg, established and published the technic that met the approval of the surgical world, and his name by common consent is given to the procedure of opening the pelvis by resection of the sacrum. The essentials of sacral resection for removal of tumor from the pelvis are that—

1. The patient be placed on his face with pelvis well raised and thighs flexed.

2. An incision be made from just posterior to the anus upward in the middle line and carried above the coccyx; then curving to the left it follows the left edge of the sacrum. It is carried down to the bone and dissected outward right and left exposing the edges of the sacrum and the sacrosciatic ligament carrying the edges of the gluteal muscle.

3. The third sacral nerves must be identified and the sacrum divided below them. They should if possible remain intact. The central canal of the sacrum should not be opened. The attachment of the sacrosciatic ligament to the coccyx should then be severed; also the lower sacrum should be freed with a blunt dissector from all connections. The amputation is best done with a wire saw. The use of chisel and mallet here causes shock.

4. Thus the field lies before us. All bleeding is arrested and the growth attacked according to its location, attachment and adhesions.

From this point the operation may be of any severity; usually it will be exceedingly simple. All Middledorph tumors should be attacked from this direction for the following reasons:

1. They lie directly in front of the sacrum. When it is lifted off they can be studied in plain view.

2. They can then be removed systematically without disturbing the remainder of the pelvic viscera.

3. The peritoneum is not opened in reaching the tumor. If it is opened later in the removal it is not traversed and infected, and its contents may be protected.

4. The cautery may be used freely without damage to other structures.

5. Extensive tissue removal in handling the tumor's connections in muscle, fat, and fascia, even bone, can be made quickly, safely, and extensively because in plain sight.

6. Scar recurrence is in plain view and accessible to secondary operation.

7. Blood supply and nerve supply can be seen and easily attended to.

All of these reasons are anatomical, have to do with technic and, are more or less self-evident. The sixth one calls upon us to go a bit more into the pathology of these growths, as it touches the treatment of their recurrence in or about the scar after operating for their removal. They are pathologically and clinically malignant. Their malignancy is clinically of the nature of the sarcoma. They travel along lines of blood supply. Their metastases are into muscle and fascia and fatty tissue oftener than lymph nodes. Their recurrence is along scars made for their removal. They show the cytology of hypernephroma or nerve tissue or mixed tumors when the pathologist examines them, but to the eye of the clinical surgeon they follow the habits of the sarcoma.

Mr. D. B. H., of Verona, Missouri, came to my service in St. Luke's Hospital March 15, 1915, complaining of pain down in the lower bowel so constant it required opiates. He was 63 years of age, a lumberman, referred to me by Dr. Loveland.

The patient suspected lues twenty years ago. He had been fairly well treated and for two years had no relapse.

There had been no subsequent manifestation of the disease.

Present Illness.—Beyond the pain in the pelvis there were no other symptoms. Two years ago he had noticed for the first time pain over the tip of the spine. He went to St. Louis and saw Dr. C. who sent him to Dr. F. Neither gave him a diagnosis. He then went to Hot Springs and was treated for lues. Afterwards was given several salvarsan treatments at Springfield. The antiluetic treatment did not help the pain. The patient was constantly in pain between times. The pain became excruciating when bowel acted. About a year ago he began to take antipyrine, codein, and phenacetine to stop the pain. Wassermann, negative.

Physical Examination.—Two weeks before the operation the examining finger came upon a more or less cystic feeling tumor in front of the coccyx and lower sacrum. It was almost in the midline and could not be moved by backward pressure.

Diagnosis.—Ventral tumor of the sacrum; teratomatous in origin, congental in development, sarcomatous in degeneration. Removal was advised and accepted.

Operation.—March 31, 1915. An incision was made from the left posterior-superior iliac spine and curved in toward the central portion of the sacrum down to the anus. The tissues were separated from the tip of the coccyx and rectum by blunt dissection, also separated from the face of the tumor. It was found on each side of the coccyx the tumor had involved each gluteus maximus. The involved portions of these muscles were cut above three-fourths of an inch to an inch on the outside of the tumor. The third sacral notch was found and the sacrum fractured across with a large chisel at this level. At this time the patient had suffered extreme shock, and the blood became very dark. The tumor was rotated out of its position and found to be limited above the peritoneum. The blood vessels were secured, the tumor removed, and all bleeding stopped; the skin was approximated. Two drains were inserted, one on each side of the rectum, and the patient was put back to bed.

Shock reappeared several times the day of operation. Drainage was out in twenty-four hours. The patient had perfect use of his limbs when recovered. All pain ceased when operation was completed. No pain since.

On September 1, 1915: The patient complains of a feeling of prolapse when bowels move, due it was found, to the

cutting away of the attachments of the levator ani muscle. An ingenious truss by an instrument maker relieved this.

On October 22, 1917: Patient is well. No trouble since relieving the anterior rectal displacement by a brace lifting the perineum. Muscles became stronger except now he has a return of pain. Rheumatism in left leg from hip downward.

On September 11, 1919: Patient returned with tumor to left of scar. This tumor was small, movable, but attached to the muscles. He entered my service at the Research Hospital and was operated on September 12, 1919. Incision was made according to, and following the line of, the former operation. At the lower angle of the incision. a hard tumor about 1 inch in diameter by 7/8 inch in length, was encountered. This was lying on the fascia involving the fascia and also the gluteal muscle. All portions of muscle and fascia involved were removed. The tumor had not attached itself to the bowel. The entire tumor and surrounding fat, fascia, and muscles were taken out and referred to the laboratory. The pathologist's report showed the growth to be hypernephroma.

The patient made an uninterrupted recovery, and was discharged October 4, the wound granulating nicely.

November 4, 1919. Patient writes that he is getting along very well. Is feeling fine, and helping to look after his business.

June 9, 1920. Patient reported at office. Examination shows a lump the size of hazel nut and movable in the upper part of the scar; also a larger lobulated tumor high up on the right side under the right gluteal muscle.

June 9, 1920. He entered my service at St. Mary's Hospital and was examined by several members of the staff. The malignant nature of the tumor was conceded because of its recurrence. He was x-rayed thoroughly before operation as follows: June 11, 1920, by 4 points of entry posterior; June 12, 1920, by five points of entry posterior; June 13, 1920, by 5 points of entry anterior, June 14, 1920, by 5 points of entry posterior.

The *x*-ray work was by a Coolidge tube 9½ inch spark gap, for seven minutes, protected by 6 filters of aluminum, 5 milliamperes of current, 8-inch target-skin distance. This being completed he was operated on June 15, 1920. The operation sheet shows the following record: The incision went to the left of the first incision of 1915 which had left a clean soft scar. The removal of the lower sacrum left

the tumor (recurrent) in plain view covered only by skin and fascia. It was very easily removed and offered but few obstacles. It was extremely simple compared with what would have been the case if operation had been attempted by any other route.

Four nodules were found, the smallest one 0.5 inch in diameter; the largest, 1.5 inches. The lowest was in the levator ani muscle fibers, the others were in the gluteal muscle. All were removed very wide of disease. The rectum was not opened but it was exposed for six inches. Care was taken to provide against prolapse of tissue by suture of the fascia to the former scar. Drainage was provided and the wound closed.

There was no shock and no delay in commencing convalescence. After examination of all tissue removed, and a careful review of the case history the diagnosis of hypernephroma was abandoned by the members of the Pathology Club and the original diagnosis of Middledorph tumor of neural origin was confirmed by them.

The patient's progress record shows the following entries:

June 15, 1920, patient had no shock, he awoke hoarse with a laryngitis; June 16, 1920, same condition of throat; June 17, 1920, removed tubes and packing from sacral wound; June 19, 1920, a little hoarse, otherwise doing well; June 21, 1920, post-operative microscopic report hypernephroma by the pathologist of St. Mary's; June 25, 1920, packing wound with balsam of Peru and castor oil because of breaking down of the lower end of the wound, wound has gray appearance at lower angle; June 26, 1920, patient is doing well. The gray appearance of the lower end of the wound has disappeared somewhat under castor oil and balsam of Peru treatment. Patient is to be discharged to-day and to place himself under the care of the family physician who will direct as to treatment. He will return at intervals of 3 weeks for further *x*-ray treatments and region is to be carefully watched.

The ease of approach, the ease of future observation and of future re-operation, and the freedom from disturbance of other organs mark the posterior route as the best route for the removal of these tumors.

The patient has since returned and has been x-rayed with a 9½ inch spark gap four times at intervals of three weeks receiving five milliamperes of current at each port of entry. He was treated through "twenty-

four ports of entry, fore and aft," at each series. The value of having all scar tissue readily accessible to *x*-ray again emphasizes the desirability of the sacral resection route for the removal of these tumors.

NOTE:—June 20, 1921. The patient returned for examination one year after the third operation and nine months after his last *x*-ray. There is no evidence of recurrence.

THE TECHNIC AND AFTER-TREATMENT IN OPERATIONS ON THE PROSTATE

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Prostatic surgery has not reached the stage of perfection and certainty that is associated with other surgical practice. The results are occasionally unsatisfactory or even fatal following a simple, easy, and rapid operation.

A few details are frequently neglected by surgeons which have much to do with the comfort and safety of the patient and the results obtained. The after-care is a very important part of the treatment and should be carefully supervised by the surgeon in order to hasten convalescence.

Castration was performed for enlarged prostate in 1893, with moderate shrinkage of the growth, but was just as unsurgical and became as unpopular as the removal of ovaries for fibroids of the uterus.

The cautery operation for obstruction was employed by several surgeons for a time, because of the unsatisfactory or severe consequences of other procedures.

At one time the majority of surgeons preferred the perineal route. The mortality rate was comparatively low following this method, but the close proximity of the bowel to the operative field often resulted in injury to the rectum. The functional results were poor, and stricture of the urethra with a dribbling or incontinence of urine or with a fistula would occasionally

result. The post-operative complaint and discomforts of these patients soon forced the general surgeon to adopt a different method of procedure.

Suprapubic prostatectomy was first completely performed, according to Young, by Eugene Fuller of New York in 1894. To complete the operation, the perineum was incised and an opening made into the bladder, at the time, for better drainage, the suprapubic wound being sutured. This method, modified somewhat, was soon adopted by the majority of general surgeons because of the good results obtained.

The mortality rate, in 1918, as reported by Blum in 2,044 cases was as follows: perineal, 6.5 per cent; by all methods, 8.5 per cent. He shows by statistics that the use of the catheter shortens life by two years and eight months.

Kidneys.—The function of the kidneys should be ascertained in all cases, when possible, before operating, and a carefully planned course of preliminary treatment, where the function is found much impaired, should be carried out.

Where the kidneys are infected and the bladder secondarily involved, a preliminary treatment of the kidneys is a wise procedure. At any rate, when such is the case, I do not believe an operation should be performed unless the case is an emergency one, if this infection is pronounced and the function poor until the function of the kidneys is as near normal as is possible and the danger point in the infection is overcome.

The gradual relief of the renal tension by daily catheterization may obviate a suppression that would follow a premature operation.

Clarence Martin says that "Decompression of the kidneys should be brought about through interrupted

catheterization carried over several days. In all probability, a large number of the deaths following the preliminary cystotomy, performed under local anesthesia, are due to sudden decompression and not to shock. The suppression that sets in indicates the marked engorgement of the renal vessels that has followed directly upon the sudden removal of the long existing intrarenal pressure. It is to obviate just such an unhappy occurrence that interrupted catheterization should be done."

Martin also states that "Certain of these polyurias presage this unhappy state, polyuria all too frequently being the forerunner of suppression."

Bladder.—When there is a cystitis the bladder should be irrigated many times before an operation is performed, or an indwelling catheter left for several days or for shorter periods with daily irrigations. This procedure is to be perferred to a two-stage operation when possible, as the second operation is usually more difficult, consumes more time, and there is a delayed recovery. In many cases it is well to make a cystoscopic examination of the bladder, as stones, diverticula, or neoplasms may be discovered in unsuspected cases. An *x*-ray outline of the bladder and kidneys also might cause the surgeon to modify the treatment.

Vaccine.—In several badly infected cases, with or without an abscess in the prostate, stock or autogenous vaccine has been of much benefit. It is advisable to determine the nature of the infection so that the proper vaccine may be administered and a guarded prognosis given. The colon bacillus is usually the predominant microörganism present. Judd states that in the Mayo Clinic "It is customary to give stock colon vaccine every three days preceding and subsequent to the operation for a time."

Apparatus.—Several years ago, I had a special apparatus made to place on top of an ordinary operating-

table to perform this operation. The main advantages of it are the location and help given the operator by the second assistant, in being out of the way and able to relieve the operator or the first assistant of the necessity of using one hand in the rectum to elevate the prostate. There is less possibility of contamination, and the operation can be performed quickly. The operator can have both hands free to dissect out the tumor, changing off, and also to sew up the capsule in case of hemorrhage. I believe the bowel is less likely to be injured in this way.

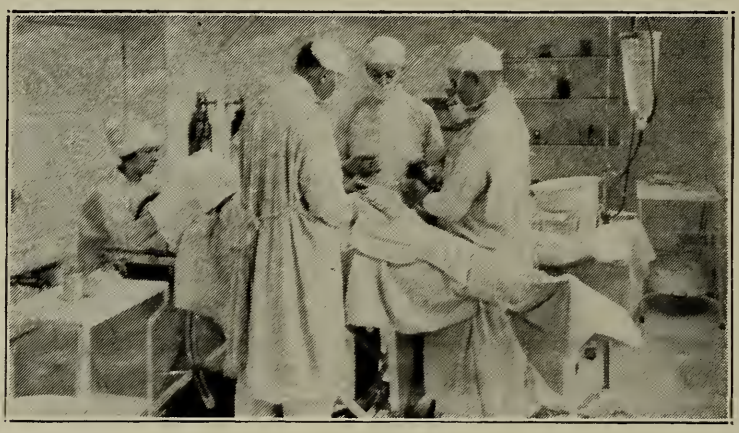

Fig. 1. Position of operator and two assistants in doing prostatectomy.

Technic of the Operation.—When the patient is in good condition for the operation, the diet is restricted for a day or two to plain, simple, and easily digested foods. The lower bowel is emptied by one or two enemas the day before the operation. A hypodermic of morphine, gr. ⅙, and atropine sulp., gr. 1/150, is given an hour before the operation. The patient's body is placed on the platform of the apparatus as illustrated, and his limbs fastened on the boards, which are well padded. The bladder is irrigated and filled with a boric acid solution while the patient is on the operating table, and the soft rubber catheter is left in and clamped. The field of operation is properly prepared and the patient's body, as well as the limbs, is protected

with sterile sheets and towels; the first assistant is placed across from the operator and the second assistant between the limbs of the apparatus and thighs of the patient. (Fig. 1.) Local anesthesia is ordinarily used, instead of a general anethesia, until the bladder is opened. After this, gas is administered and often followed by ether or, occasionally, local anesthesia is

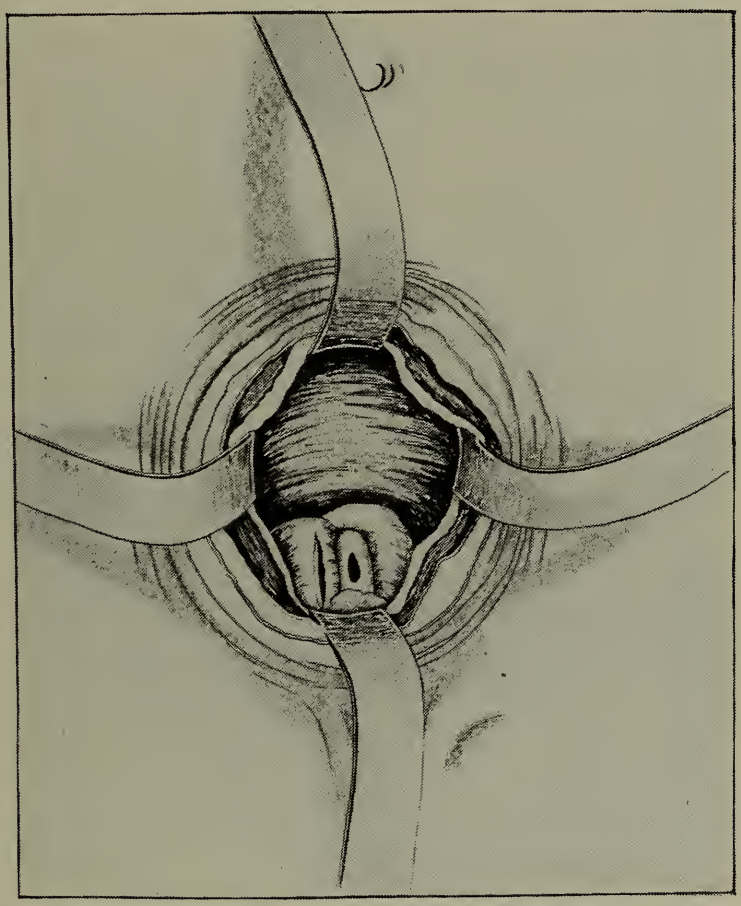

Fig. 2. Retractors in bladder, exposing prostate, and small incision in capsule.

employed to finish the operation. When the incision has reached the bladder, the peritoneum is pushed up from the fundus of the bladder, and the bladder wall is secured by three sutures of chromic catgut before it is open, one passing through the fascia, recti muscles, and bladder wall transversely to close off the space of

Retzius, and the other two passing through the bladder wall parallel to each other, between which two the bladder is incised as high up on the fundus as possible, thereby avoiding the venous plexus of Santorini. When the bladder is opened the clamp is removed from the catheter, allowing the solution to escape from the bladder and thereby keeping the wound dry. The wound can be further protected by securely clamping a rubber drain around the opening close to the bladder.

If local *anesthesia* is to be continued, a self-retaining retractor or single retractors are used to expose the

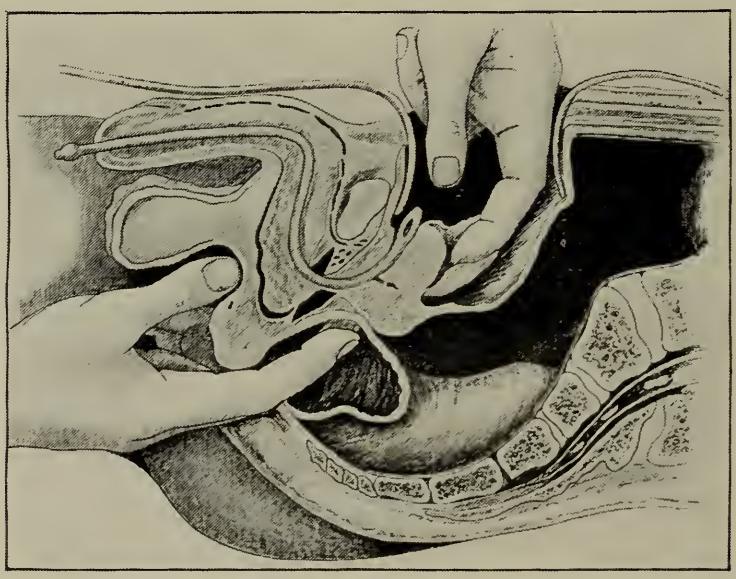

Fig. 3. Second assistant's fingers in the rectum for support.

prostate. (Fig. 2.) The prostatic capsule is anesthetized or gas is then administered.

The second assistant, with two fingers in the rectum, raises the prostatic growth. The mucous membrane is nicked anteriorly to the internal meatus or over the most prominent portion. Through this opening the finger of the operator is thrust, and the tumor separated from the surgical capsule or healthy glandular tissue. This is quite readily done in most cases unless

the growth is malignant. With the assistant's fingers in the rectum, below, the operator can easily determine whether all the growth has been removed or not; a firm opposing force is present to work over, making the dissection less difficult. (Fig. 3.) Often the growth can be removed in one piece through the enlarged opening made through the mucosa. Any tags of mucous membrane are removed and excessive bleeding points in the mucosa or capsule are sutured with plain catgut. I prefer this to packing with gauze.

When bleeding continues, a strip of gauze presses the capsule into the cavity, covering as well all raw surfaces, and the loose end of the gauze is brought out through a short rubber tube in the bladder. This tube may be connected to a longer tube to carry off excessive drainage and thus keep the dressings dry.

In the ordinary case we employ a double tube arrangement which has been used by other operators, in a modified form, for drainage. A long chromic catgut suture is passed through the end of the catheter in the bladder. It is then brought out through the outer rubber tube, which is fastened in the bladder, in a position as high up as possible, with two purse-string sutures of plain catgut, inverting the bladder wall. The opening in the bladder above and below these points is securely sutured with a double row of chromic catgut, also inverting the mucous membrane. One plain catgut suture passes through the tube and bladder wall to anchor it. The bladder is then firmly brought up and securely fastened to the abdominal wall and the space of Retzius obliterated so that infection may not occur at that point. All this care, I believe, has much to do with the rapid healing of the supra-pubic wound.

The skin and subcutaneous tissue should not be stitched too near the tube so as to facilitate drainage and thus prevent extravasation of blood, serum, or

urine, which might result in subcutaneous infection and slow repair of the wound.

The tubes used for suprapubic drainage are as small as can be consistently employed, so that the closure will be more rapid when the tube is removed. The second, or inner, tube, which is much longer than the outer tube, should fill the lumen of the outer tube. It is passed inside the outer tube, extending into the bladder. The catgut sutures anchoring the catheter are between

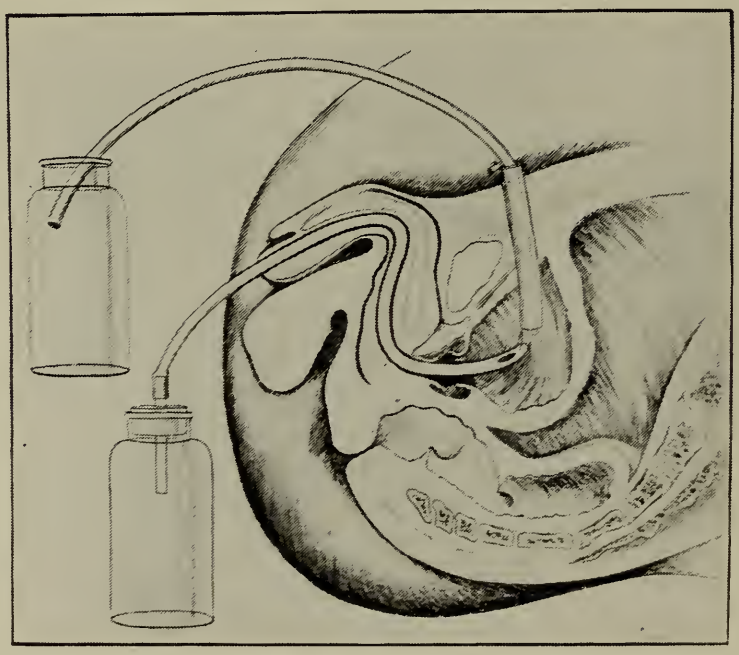

Fig. 4. Drainage tube and catheter in position.

these two tubes, which are tied over a cross-piece at the end of the outer bladder tube, the suture being of sufficient length to hold the catheter in the bladder at the proper point. (Fig. 4.)

Both catheter and suprapubic drainage tubes are connected with separate bottles. The catheter bottle is tightly corked so that no soiling of bedclothes or dressings can result, adding much to the comfort of the patient, and, I believe, outweighing the advantage of early removal of the suprapubic drain. The cathe-

ter is held in place firmly and without the discomfort experienced by the ordinary fixation. After the operation is completed, the bladder is again thoroughly washed with warm boracic acid solution from the catheter into the tube and vice versa, in order to wash the clots of blood out. This irrigation is usually kept up, at a low pressure, every two or three hours afterwards, so that no clots form. Distress is lessened, and it prevents infection and a rise in temperature. As soon as bleeding is not in evidence, the irrigations are less frequently employed and discontinued, except once daily while the catheter and tube remain in position.

In case of necessity the inner tube may be removed so that any collected clots may be washed out from below or dislodged from above. This, however, has not frequently been found necessary under the plan above employed.

Post-operative.—The patient usually makes a very satisfactory and steady convalescence, and is allowed to get out of bed in from five to ten days.

The outer tube usually is removed as soon as firm fixation of the tissues has taken place. This is usually at the end of the tenth day or when some leaking occurs around the tube. The urethral catheter is kept in place for a number of days, thereby preventing saturation of the dressings. After the tube is removed the patient is encouraged to bring about a normal and natural evacuation of the bladder by endeavoring to empty the bladder at frequent intervals, at the same time using external pressure to force the recti together with the hands on the dressings. An indwelling catheter, worn subsequently for a day or more at a time, relieves the internal pressure and therefore allows the suprapubic wound to unite sooner. Strapping the edges of the wound with sterile adhesive, pulling

them together at this time, is of much benefit. The use of the sound to keep the prostatic urethra well dilated assists in the closure of the wound. If infection of the bladder exists, the bladder should be irrigated daily and vaccine employed. Infected kidneys may prolong the convalescence and occasionally are the cause of persistent pyuria. A recurrence of the growth may be from carcinoma, new tissue formation, or incomplete removal of the growth.

Antiseptic and astringent dressings, such as balsam of Peru, Dakin's, or Dichloramin-T, or silver nitrate may be used to advantage. Should the urine leak for too long a time through the abdominal wound or an extravesical abscess form, a second operation should be performed, in the first instance, to freshen and reunite the walls, and, in the second, to eliminate the pus-containing cavity.

CONCLUSIONS

Prostatic surgery has not reached the stage of perfection that is associated with other surgical work.

The outcome is occasionally unsatisfactory on account of the undetermined resistance and complicating conditions present.

The functional results following certain types of operations upon the prostate are often poor.

The mortality rate is relatively high for the suprapubic operation, but the functional result and comfort of the patient have influenced most surgeons to adopt this method of operating.

Every patient should be in as good a condition as possible before the operation is performed.

Vaccine treatment sometimes assists in overcoming infection.

A special apparatus, in doing the suprapubic operation, usually makes the second assistant of great value to the operator, facilitates the work, and makes it easier and more rapid in its execution. Interrupted catheterization or an indwelling catheter is employed for several days where there is much residual urine before an operation is performed.

Local anesthesia, gas, and ether are the usual anesthetics.

The incision in the bladder is high up in the fundus.

The growth is dissected out with the finger, as a rule, over the second assistant's two fingers in the rectum. The bleeding capsule is usually sutured into the depression left in the prostate.

A double tube for drainage of the suprapubic wound is employed and a catheter is retained in the bladder by a suture passed through the internal end of the catheter and secured by extending it between the two suprapubic drainage tubes and anchoring it. Satisfactory convalescence by this method is more assured, infection less likely, and the comfort of the patient is much greater.

The bladder is irrigated frequently, preventing clotting and infection. The wound is kept dry for the greater portion of the convalescence.

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DISCUSSION

Dr. N. J. Maclean (Winnipeg, Manitoba): This subject is one of great interest. I agree with the last speaker on the two-stage operation.

Sometime ago I had two cases where there was stone-formation in the bladder following prostatectomy. One case was passing small stones continuously with a great deal of discomfort and pain, and the other case, three years after the operation, had the bladder filled with large stones—as large as small hen's eggs.

The after-treatment is important. As far as the after-treatment is concerned, in my own practice, we simply put in a large tube and in twenty-four hours aspirate the urine that is in the bladder and put in argyrol solution. This is left in the bladder. The treatment is repeated once a day until the wound is closed. Since we have adopted this procedure we have not had post-operative stone-formation.

Dr. Leonard Freeman (Denver, Colo.): The principal point to bear in mind is that these operations are done upon old men, whose resisting power is reduced by loss of sleep, by sepsis, by old age, and by kidney troubles. Any operation that is done ought to be the simplest and quickest one possible. As regards hemorrhage: There are various methods of controlling it. One is to sew up the prostatic wound. I question whether that is as good as some of the others, as it takes a considerable amount of time and manipulation. I do not believe it is necessary.

I have used a very simple method for a number of years. A long and narrow strip of gauze is packed into the prostatic

wound, its free end being held in the grasp of a pair of long, blunt-pointed forceps, the handles of which are allowed to project through the abdominal wound. A bandage (elastic if desired) is then passed around the pelvis and over the fork of the handles, thus making pressure through the forceps upon the packing and preventing it from floating out of the prostatic wound when the bladder fills with urine. In addition the pressure can be directed in any direction by shifting the angle of the forceps. In the course of some hours the forceps can be pulled out of the wound, bringing the gauze with it.

Another point: In removing the prostrate, I believe it is easier for one to work entirely with one's own fingers than to use the fingers of an assistant. In other words, two hands belonging to one man can work more intelligently together than the hands of two different people, and, if any sort of care is used, there need be no concern regarding sepsis.

I do not favor local anesthesia. It is hard on the patient physically and mentally, to say nothing of the operator. I do not believe it is necessary. I find gas and oxygen both safe and satisfactory.

Dr. Benjamin gets beautiful results in what he does. He carries out these things in a most skillful manner. Nevertheless, I believe that the quicker and the simpler method is the better.

Dr. Benjamin (closing): I think we should get these cases used to having a catheter in the bladder before the operation. In regard to the irritation of the catheter: Patients complain very little about it when it is fastened in the way I mentioned. There is no irritation of the tissue, and that is the reason I have adopted this method. I presume if I did not wash the bladder out several days before we operated, and leave the catheter in for some time, they might complain more than they do.

In regard to the preparation of the patient: The urea content should be as low as possible. We must get these cases so that the function of the kidney is as near normal as possible.

I very seldom do the two-stage operation. I prefer to use the catherer, leaving it in for some time. If you do not relieve the back-pressure before these operations, and suddenly take away that pressure, you have inactivity of the kidney.

I am glad Dr. Maclean brought out the use of argyrol. We most always use argyrol, or an equivalent, in these cases to wash them out. I remember one case similar to the one he reported. Stones kept coming down and lodging in the bladder. We did not take an *x*-ray, as at that time we had very little use of the *x*-ray. The Wilson tube is practically the same as the double tube. This one serves the same and a better purpose. The dressings are dry. As soon as the tube comes out, we instruct the patient to evacuate the bladder frequently by pressing upon the sides of the wound at the same time: less urine will flow out of the wound, and having the catheter in the bladder, the wound closes very rapidly. Ordinarily, we use a small tube and keep it perfectly clean and draining well; the wound heals up quicker.

Dr. Freeman mentioned a simple method. That is what I have been endeavoring to accomplish in this work. At first, I could not get used to an assistant's finger in the rectum, but I have become accustomed to it, I have both hands to work with, and can do more complete and quicker work.

COMPARATIVE RESULTS OF PYLOROPLASTY AND OF GASTRO-ENTEROSTOMY IN STOMACH SURGERY

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OMAHA, NEBRASKA

For a long time the leading internists have been criticising the results in gastric surgery. So many To be sure, we may very fairly come back with the retort that after medical treatment has failed and where surgery relieves 60 to 70 per cent of these cases, the medical man has little ground for criticism.

In a recent article Bastedo, of Columbia University, makes the startling statement that "in our own practice ulcer cases that have had one or more operations come for treatment almost as frequently as ulcer cases that have not been operated on." This seems to be an extreme assertion, but when we ask almost any internist of his experiences he voices the same sentiment. Smithies, out of 226 cases of gastro-enterostomy operations for gastric and duodenal ulcers traced, reports only 57, or 20.9 per cent, were clinically free of complaints. This leads one to ask if the operative results in the field are good enough to satisfy the composite surgical conscience.

As the results now stand, from 15 to 40 per cent of the operations done for gastric ulcers are failures; at least, they do not restore the patient to sound health. There has been a tendency to explain the imperfect results on the ground that the operation was ill advised and the technic faulty. Moynihan asserts that many of the poor results following gastro-enterostomy have been due to (1) Operation done in the absence of any organic lesions justifying it; (2) in cases of chronic

extragastric lesions that have been overlooked; (3) incomplete operation, the ulcer not having been dealt with; and (4) various defects in technic.

I am willing to concede that many of the failures are avoidable, but even with these surgical errors eliminated numerous cases report for treatment with symptoms little improved, or as bad or worse than before the operation. The stubborn fact is, that there are many disappointing results following gastro-enterostomies done by the best surgeons following the most approved methods.

Wilensky, speaking of the current operations for ulcer, says: "None of these methods are ideal, however, and numerous recurrences of symptoms testify amply to the fact that the last word has not been said in the treatment of ulcer, and account for the diligent efforts which are everywhere being made to improve the surgical method of therapy for gastric and duodenal ulcer." Robert Hutchinson concluded that "Gastro-enterostomy profoundly affects the gastric functions, both secretory and motor, and it is not the simple drainage procedure sometimes pictured."

When one stops to analyze the revolutionary changes in the physiology of the stomach which follow a gastro-enterostomy, the operation usually practiced in gastric and duodenal ulcer, one is not surprised at these statements from such eminent authorities.

Normally the food when it enters the stomach is subjected to a very thorough grinding and mixing with the gastric juice, and, as stated by Howell, "There is a certain orderliness in the movements of the stomach, and especially in the separation and ejection of the more liquid from the solid parts, which shows the existence of a specially adapted mechanism." Chymification is complete before the closed pyloric sphincter permits its entrance into the pylorus.

As soon as the acid chyme enters the duodenum the creatic secretion begins. Then by the process of prosecretin is transformed into secretin and the pan-"rhythmic segmentation," so vividly described by Cannon and Blake, the duodenum, by mean of vigorous churning movements, brings the bile and pancreatic ferments into intimate contact with every particle of the chyme before it is permitted to pass onward into the jejunum. This thorough contact is necessary to insure complete digestion.

When a gastro-enterostomy opening is made, if it functions as the operator desires it to do, a revolutionary change in the physiology of digestion takes place. When one considers the coarse boluses of food, imperfectly charged with gastric juice, which are propelled through the artificial stoma into a jejunum unprepared for such treatment, and with no special mechanism for mixing the food boluses with the bile and pancreatic juice, one wonders that gastro-enterostomized patients get along as well as they do. That such a radical upsetting of the normal mechanism does not always produce disaster speaks volumes for the adaptability of the human digestive function.

Bayliss and Starling proved that when they isolated a loop of jejunum by cutting off the nerve supply and ligated both ends of the loop, and then injected 10 c.c. of a 0.4 per cent solution of HCl, pancreatic secretion promptly began. But Bayliss and Starling and Wertheimer and Lapage showed that the greater the distance from the pylorus the acid entered the intestine the less pronounced the effect and the scantier the pancreatic secretion. It is fair to conclude that to get the best functional activity of the pancreas the abundant secretion formed by the presence of the acid chyme in the duodenum is necessary, and that when the gastric juice enters the intestine lower down the

normal physiological activity of the pancreas is somewhat impaired.

Entire satisfaction with any operation can never be obtained till the failures and disappointments are reduced to a minimum. The poor results following gastro-enterostomies have too often, it seems to me, been set down as due to faulty technic, to having been done in the absence of organic lesions justifying the operation, to incorrect diagnosis, etc., and apparently without considering that there may be some inherent fault in gastro-enterostomy, bound to be followed by many poor results, no matter how carefully the case is chosen nor how technically perfect the operation.

Moynihan, while believing that many bad results follow ill-advised and technically imperfect operations, frankly admits that other cases, done according to the best light we have at the present time, have some very unpleasant sequelae. He sums up the prevailing symptoms complained of by these uncured patients as pain, vomiting, hemorrhage, and diarrhea. Regarding these four symptoms it can be shown that any or all of them may and frequently are caused by altered physiology and by the stomach emptying at a point more or less remote from the general direction of the peristaltic wave, and entering the intestine at a point not physiologically adapted to the function thus forced upon it.

Pain.—Moorhead shows that the pain is sometimes due to forcible peristalsis against a closed pylorus. He has found in these cases the pyloric antrum is dilated and its muscular wall hypertrophied. Watching with the fluoroscope, he has noted that at the exact moment a strong peristaltic wave has impinged against the pylorus the patient has experienced the exact type of pain for which he seeks relief. Pain is also due to recurrent or unhealed ulcers, also to the occurrence

of jejunal ulcer, which I believe, is much more frequent than usually supposed. Although often due, no doubt, to unabsorbable sutures, many cases have been reported where jejunal ulcer has followed gastro-enterostomy when none but absorbable sutures have been used. A jejunal ulcer is a more serious lesion than that for which gastro-enterostomy is usually done. Colic and intestinal soreness are frequent results of the rapid entrance of coarse unchymified food into the jejunum. This material is usually highly acid, not having been neutralized by the alkaline bile and pancreatic juice.

Hemorrhage.—Most of the sources of hemorrhage will be the same regardless of the type of operation, but the one very frequent source, jejunal ulcer, is a direct result of gastro-enterostomy.

Vomiting.—Obstruction, because of a kink of the efferent loop of the jejunum, was found by Cannon and Blake to be the most frequent cause of failure after gastro-enterostomy. Vomiting from this cause is frequent, no matter who the operator nor how carefully he may seek to avoid this condition. Bile and pancreatic juice enter the stomach through the artificial stoma, and if the pylorus is patent more or less vomiting is likely to result from this cause. Improved technic has almost wholly overcome the acute early vicious circle which formerly cost so many lives, but it is impossible to get away from the fact that a vicious circle is often the cause of ill results, though it is not so deadly as when the long loop operation was in fashion. Reflex vomiting sometimes occurs as the result of a severe colic produced by the rapid filling of the small intestine when the stomach empties too rapidly.

Diarrhea.—This is a frequent result of gastro-enterostomy, and it is probably usually due to too

rapid emptying of the stomach. The food that enters the jejunum is not well mixed with the gastric juice and little, if at all, with the bile and pancreatic juice. Normal digestion under such conditions is impossible, the food acting merely as a foreign body and an irritant to the intestinal mucosa. A resulting diarrhea is the natural consequence. It is fair to say that the diarrhea is probably beneficent since it gets rid of an irritating foreign element. Andrews and Mix have recently reported a case where the entire food taken passed directly through the stomach, via the gastro-enterostomy stoma, without time for any action by the gastric juice. It was necessary to get an *x*-ray picture within thirty seconds of the time the opaque meal was ingested or they found the stomach empty. Doctor Andrews gave this condition the highly descriptive name of the "dumping stomach." Cramping of the bowels and what the patient called the explosive bowel movements were complained of with general soreness over the abdomen and loss of weight.

Most of the symptoms that have been noted are due inherently to gastro-enterostomy. They are the result of a disturbed physiological process. The act of digestion is one of the most important functions performed by the body, and it would be a great boon if it could be found possible to relieve the distressing symptoms of ulcers and stenoses by a less revolutionary procedure. Gastro-enterostomy has saved thousands of lives and will continue to save lives in certain types of trouble, but it seems to me there are reasons without number why a more physiological method should be adopted in the treatment of many of these cases.

Given the bare physiological facts without any of the prejudices of past experience, there is not one among us who would not consider the rational manner of dealing with the problem would be excision or cauterization of the ulcer and enlarging of the natural outlet

sufficiently to secure free unhindered emptying of the stomach.

It seems that the various operations introduced which allow emptying of the stomach contents directly into the duodenum have been condemned without due trial. Most of the surgeons who condemn pyloroplasty have done so without any experience or after a most meagre trial of the method and many times with all the signs of a prejudged decision.

Some eminent surgeons dismiss the subject with a few kind words that are really damning so far as their influence on others is concerned. For instance, Sir Berkley Moynihan says: "The operation of Finney and the operation of Koch have, however, a distince place in surgery, and it is by no means unlikely that in the future they will be performed in a certain class of cases for which gastro-enterostomy is now the chosen method." Warbasse, speaking of the Finney operation, says: "It is one of the most useful operations in surgery, and is destined to play a larger role than has yet been its lot." Doctor Binnie says: "Finney's operation is a most valuable contribution to surgery and in many cases it is a desirable substitute for gastro-enterostomy."

Unfortunately, most of the surgeons who speak so kindly of this operation go right on performing gastro-enterostomies. That more do not resort to some form of pyloroplasty I believe is largely due to the fact that they are familiar with gastro-enterostomy and because of a widespread but erroneous opinion that mobilization of the duodenum is extremely difficult and dangerous.

In proposing wider use of a more physiological operation for the various lesions for which gastro-enterostomy is usually done I do not wish to plead for any one of the several admirable operations already

well known. The Heineke-Mikulicz pyloroplasty, as usually described in the books, does not seem adequate. The opening made is too small to serve its purpose; but, as Mikulicz describes it, the procedure is more extensive. The incision is made on the stomach wall and duodenum far enough to make an adequate stoma.

The operation as done by Finney seems to meet all the requirements, and the size of the opening may be as small or large as seems necessary to meet the needs of the case. All that is necessary is to make an opening large enough to function easily after the narrowing which comes with the decrease in size of a dilated stomach. Finney and Friedenwald advise dealing with the duodenal or pyloric ulcer through the gastroduodenostomy incision, and consider "the opportunity thus afforded to explore digitally and inspect the ulcerated area and then excise it through this incision is one of the strongest points in favor of the operation." They report 100 cases with five deaths from the following causes: (1) persistent vomiting associated with pregnancy; (2) atrophy of the liver; (3) bronchopneumonia in six days; (4) shock; and (5) chronic nephritis (uremia). Eighty-two cases were traced to the end of the first year and the result in 93.6 per cent was satisfactory. Can anyone make as good a showing from an equal number of gastro-enterostomies?

There are bound to be some cases where the conditions are unfavorable for pyloroplasty. Dense massive adhesions about the pylorus and duodenum will render this operation inadvisable because of the difficulties and dangers and because post-operative obstruction would be probable. Finney also excludes the cases where great thickening and infiltration about the pylorus would make the operation inadvisable. They found in most of their cases having hyperchlorhydria before operation, that the acidity gradually

lessened and a normal was reached on an average of about two months.

The operation devised by Horsley, of Richmond, for its simplicity, appeals to one, if further trial shows it to be permanent in its good results. It combines resection of the ulcer with pyloroplasty which extends at least two inches into the stomach wall and one inch on the duodenum.

To recapitulate: The main objections to gastro-enterostomy are: (1) Peristalsis carries the chyme past the gastro-enterostomy opening forcibly against the pylorus, and whatever gets through the artificial stoma leaks through, following the law of least resistance. (2) The material that reaches the jejunum is much of it unprepared, chymification is incomplete, it is not yet thoroughly mixed with the gastric juice, and it is not intimately blended with the bile and pancreatic juice as is so perfectly done by the rhythmic segmentation which takes place in the duodenum. (3) Because of the facts just given, digestion is imperfect and incomplete, the intestinal mucosa is irritated and in many cases greatly inflamed, an abnormal amount of gas is present, and the patient suffers from colic, diarrhea, and lowered nutrition. (4) Jejunal ulcer, a condition much worse than the original disease for which the operation was done, is a direct result in frequent instances of this unphysiological procedure. (5) The amount of secretin produced in the jejunum is less than normal and there is probably a subnormal amount of pancreatic secretion when all of the stomach contents enter directly into the jejunum. (6) A large meal completely filling the stomach will, as shown by Cannon and Blake, so stretch the stomach side of the gastro-enterostomy stoma that the distal side of the jejunum will shut down against the opening like a lid and absolutely prevent stomach contents entering the jejunum.

Pyloroplasty or gastroduodenostomy does not have these objections, but has the advantage of permitting the digestion to go on normally. The opening is in the regular highway of the peristalic wave. Even when the sphincteric action of the pylorus is destroyed the rhythmic segmentation of the powerful duodenum will prevent the stomach from emptying too rapidly. Later, if the pyloroplasty has not been made too large, the pyloric sphincter will function to a certain degree on the same principle that the anal sphincter acts after it has been cut.

It seems to me that a great improvement in results will be obtained when a universal friendly coöperation is established between the internist and the surgeon. Too often a spirit of rivalry has entered in and the controversies have sometimes been a little acrimonious. In gastric and duodenal ulcers there is a distinct place for the internist and for the surgeon.

When one of these cases falls into the hands of an internist it would seem only fair for him to appreciate that this is a borderline case and call in a surgeon in order that the patient may have the advantage of both viewpoints; and the surgeon should not operate on one of these cases without the benefit of a good, clear-headed internist's advice and counsel.

Each case ought to be worked out carefully from all angles, a good anamnesis secured, the clinical symptoms weighed carefully, the physical signs gone into thoroughly, the chemical and *x*-ray findings considered in an unbiased manner, a Wassermann test made in every case, and the patient's general condition and resistance sized up as fully as possible. If further medical treatment is deemed advisable, always considering the welfare of the patient first, let that be done, and, if treatment succeeds, so much the better. If no benefit is derived from medical treatment or if

the symptoms recur, surgery should have its innings. And when an operation is done it is a great comfort to have a friendly and resourceful internist at one's elbow, and let the type of operation be worked out together.

When an operation on the stomach is begun it should stop short so far as the stomach is concerned unless real pathology is found. Failing to find the expected gastric or duodenal lesion a thorough survey of the intra-abdominal viscera will often be rewarded by finding some unexpected pathology which explains the symptoms.

It is my opinion that active ulcers are better dealt with by excision or, better still, by cauterization, as so admirably worked out by Balfour. It is also important, when operating on ulcers, to find and remove the focus of infection from which the ulcers had their origin. The gall-bladder and appendix are always under suspicion, and no operation is complete until these organs have been inspected carefully and removed unless normal.

One of the sins to which too many of us must plead guilty is operating on these patients and turning them loose. In these chronic cases the operation is only the first step in the cure. Every case should be treated carefully, medically and dietetically, for months and often for years before being considered cured in the sense that he may be permitted to go along and live and eat in his own way without medical guidance.

I am convinced that if these cases are systematically studied post-operatively from the standpoint of symptoms, chemistry, and *x*-ray findings, the knowledge gained will be illuminating. Many of the so-called successes will be disappointing, especially if the follow-up system is carried out over a series of years. That type of operation will be adopted in the final

chapter that leaves the stomach mechancially and physiologically in the most normal condition.

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DISCUSSION

Dr. Leonard Freeman (Denver, Colo.): I do not feel that it is quite fair to say that we do not use the Finney operation because we not familiar with it. I am reasonably familiar with it, but I do not often use it. On the one hand, where there is a decided pyloric obstruction the Finney operation is rather difficult to do, and it is not necessary. Under such circumstances a gastro-enterostomy works unusually well, and there is no objection to it. On the other hand, a gastro-enterostomy does two things which the Finney operation does not do. It prevents the gastric contents from passing in such great quantities over a pyloric ulcer, and it changes the acidity of the stomach by the admission of bile. I submit that these are the reasons we do not use the Finney operation as much as we do the operation of gastro-enterostomy.

Dr. St. Elmo M. Sala (Rock Island, Ills.): It seems that these pictures shown by Dr. Davis were not taken in a standing position. If your anastomosis is down at the bottom, the stomach will empty immediately. The stomach drops clear down into the pelvis normally in the standing position. It seems to me that you are going to have a dumping stomach,

and I think that all pictures should be taken in a standing position so you can see where this anastomosis is. If the anastomosis is as near to the pylorus as it is possible to make it, its contents will have to go up hill, so to speak, and thus be a more natural process.

Dr. Arvine E. Mozingo (Indianapolis, Ind.): I wish to report a stomach case which I saw five years ago in New York City. The case was a man, aged 50, muscular, weight 180 pounds. His general condition very good. He gave a history of having had a severe case of typhoid fever twenty-one years before, complicated by ulceration of the esophagus, resulting in complete obstruction. A gastrotomy was performed on him in Philadelphia, and since that time all nourishment has been taken through a 1 cm. rubber tube 10 cm. long. The tube fits snugly and was held in place by a large safety pin under which was a small gauze pad. A cork was held in the end of the tube by means of an abdominal binder. When a drink or food was desired the cork was removed and a funnel inserted into which fluids were poured, or, in case of thick pastry foods, they were forced into the stomach by means of a ramrod. Meats and other heavy foods were usually chewed, not only for mastication, but for the pleasure of taste and smell before being dropped into the funnel. The man would remove the tube about once each month to clean it. There were no irritation about the opening and no pain. The only discomfort experienced was due to the formation of gas at times, and being unable to belch up this gas, it became necessary to pull the cork.

Dr. Herman E. Pearse (Kansas City, Mo.): There are some facts to be taken into consideration in connection with the study of gastro-enterostomy and its end-results.

First, we must discount loyalty to the surgeon on the part of the patient. It is not enough that they report themselves cured. We must get specific information as to vomiting, nausea, mixed eating, and body weight.

Second, gastro-enterostomy is not a drainage operation. The operation is most successful that places the stoma at the point of greatest acidity where alkalis can relieve the acidity, whether it be near the pylorus or fundus.

Dr. Arnold Schwyzer (St. Paul, Minn.): It seems that both methods, the gastro-enterostomy and the Finney methods have advantages, but to really decide which is preferable one has to take one's own experience of years ago and go through it carefully. I tried to do that, and I wrote circular letters to

all of the patients that had stomach operations within the last fifteen years, namely, about one hundred forty. There were many gastro-enterostomies and about ten pyloroplasties. I was quite surprised to hear of the large proportion of good results that the gastro-enterostomy people were reporting. I was impressed by the one fact that the farther the operation dated back, the better were the reported results; and the oldest ones had the best. In fact, I had to come to the conclusion that, not only do these people after drainage operations become, as a rule, free from pain, but they must have a very good resistance because they were practically all living and were—many of them—already along in years. The results after pyloroplasty (about 10 cases) were not quite so good as the results of gastro-enterostomy. There were a number of cases of dilated stomach, and in these cases you want to use a free and direct drainage as given by gastro-enterostomy. I think if we only judge from general impressions without going into an exact investigation of the late results in our cases, we are liable to be too much impressed by certain outstanding cases, good or bad. I can say that the end-results were much better than they are given in most books, especially books on internal medicine. The end-results of pyloroplasty were not quite as good as those of gastro-enterostomy.

Dr. Edward C. Moore (Los Angeles, Calif.) : I am sorry we do not have more papers of the character of the one presented by Dr. Davis this morning. If we were all satisfied with gastro-enterostomy, there would not be so many operations to correct this difficulty. Smithies reports a large number of cases of normal acidity in the stomach with ulcers. I myself hesitate very much to do a gastro-enterostomy on the duodenal ulcer in which there is no obstruction.

Dr. Davis (closing) : I must say that I feel grateful to hear all these discussions, for I expected to be mobbed when I got through. I appreciate the criticisms that are made of the paper. I may say that this paper was written because I am in a groping frame of mind so far as this whole subject is concerned. I have seen many unsatisfactory results in the last few months coming from operators that are best known and best recognized for work of this kind.

I do not distinctly recommend the Finney operation or any other operation. The only point I am making is, that we are getting 60 to 75 per cent of very satisfactory results from gastro-enterostomy. That is a large percentage. Some of these cases I have seen have been in a most serious condition,

and because of this fact it seems we are not getting satisfactory results. I have studied quite carefully three or four cases within the last few weeks where, it seems to me, the only thing you could touch upon as the cause was the fact of the jejunum receiving ill prepared food for digestion.

These cases will almost invariably be greatly relieved after the operation. However, we do get good results. In these pictures there were two cases of recurrent ulcer very greatly relieved. The reason they are improved is because most of the stomach contents will pass through the gastro-enterostomy stoma, and this gives the ulcer a chance to heal. I am very much inclined to think that the hyperacidity is not because of ulcer, but a result.

The real cause of ulcers is due to focal infection. I think the chemistry of the stomach does not have much to do with the appearance of the ulcer; however, I may be wrong about this. I do believe we are on the right track, and in the course of time one or the other thing is going to happen. We are either going to do a lot more gastro-enterostomies or we are going to find a more natural outlet than we get from the gastro-enterostomy.

ACUTE MECHANICAL OBSTRUCTION OF THE SMALL INTESTINE

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Our flattering lay friends still greet us with the old remark, "How tremendous are the advances of modern surgery." Meanwhile one-half of the persons who have been operated on for intestinal obstruction within the past few days, will be dead within a week. This 50 per cent mortality is probably no exaggeration, although we welcome the recent statistics from certain clinics showing a slight reduction.

All papers upon this subject both begin and end with a plea for early operation. The death rate following operations between the forty-eighth and seventy-second hours is greater than within the first twenty-four; after the third day it is generally conceded that the chances of recovery are minimized. This has always been true, and yet we blunder on. Why do we blame our internist friends for delayed diagnosis? Who of us can deny that he has operated on at least half of his cases of acute obstruction later than he might have and later than he should have? We used to blame our operative mortality in appendicitis to the stupidity of the physician; nevertheless, our mortality in bad, late cases of appendicitis is almost negligible to-day. Improved surgical technic is generally is at least half responsible for the lower mortality in surgical diseases. So also must it be in intestinal obstruction. We should cure all of the early cases and many of the late ones; and late some of them will always be, because of the inevitable obscurity in the diagnosis of many of these cases.

The medical student is launched upon the world with fecal vomiting as his illuminated picture of intestinal

obstruction. Would that he had never learned this term. Better teach him that fecal vomiting and calling the undertaker are closely related terminating features. The student's lecture notes of intestinal obstruction contain much about pulse, temperature, leukocytosis, and facies, distension, and visible peristalsis. Better that he should learn to give less attention to such symptoms and signs, and make his diagnosis upon pain, vomiting, and constipation; *and the greatest of these is constipation.* What an extraordinary phychological phenomenon is demonstrated when we scrutinously observe a patient day after day without clearly realizing that his bowels do not move, cannot be made to move, and consequently will not move. Even under such conditions we are not infrequently unable to form a mental picture of a mechanical obstruction of the bowel. Of course we think that perhaps the bowels do move, or may have moved, or will move. We try to picture the condition before us as a temporary paralytic ileus, when the obstruction may be all the while mechanical. The dread of a developing peritonitis following operation detracts our attention from the possibility of a mechanical block caused by postoperative adhesions or from local obstructive ileus associated with local peritonitis. Then we are prone to watch the stomach contents and the abdomen itself without working repeatedly with enemas to determine definitely whether or not an intestinal obstruction actually exists. Constipation, stubborn, persisting, and repeatedly unyielding—why not hang to this symptom as almost our sole guide in the diagnosis of intestinal obstruction? Having determined this, then, with the help of other symptoms, try to determine whether the obstruction is due to adynamic, paralytic ileus, or to an actual mechanical obstruction. There are but two types of intestinal obstruction which are not likely to be corrected by opening the abdomen. These are all types of paralytic ileus without peritonitis, and postoperative paralytic ileus with general peritonitis. Since all types of

ileus are, to a greater or less extent, mechanical, and since all types of mechanical ileus should be promptly operated on when repeated failure to obtain an actual bowel movement or upper bowel flatus occurs, one should then lean strongly towards operation unless there is conclusive evidence of one of the types of paralytic ileus to which I have referred.

Probably one of the chief causes of our delayed operation for intestinal obstruction is our everlasting dread of unnecessarily opening the abdomen. Would it not be well to establish a new adage to the effect that any competent and distinguished surgeon should open the abdomen unnecessarily several times a year? Let the layman with trouble in his abdomen learn that he is far better off with a good surgeon even unnecessarily exploring it than with any number of poor ones gazing at the outside of it.

So much for the causes of delay. The difficulties of diagnosis, the misapplied symptomatology, the neglect of the leading symptom, constipation, and the ever-present reluctance to open the abdomen unnecessarily —grant that these are contributing to the high mortality, I yet turn to our surgical technic, which is undoubtly faulty and to a great extent responsible.

I propose to limit myself to the subject of acute mechanical obstruction of the small intestine.

Four cases of my own in the past six months are fresh in my memory. A careful review of the papers of the past three years has further impressed me, and now I venture the statement that the causes of our failures are these: too many resections and anastomoses and too little external bowel drainage.

The admirable experimental work from Chicago, Baltimore, and New York laboratories is reviewed in all publications on this subject. We must accept from these certain facts. A toxic substance is formed in distended bowel which is absorbed in proportion to the degree of destruction of the mucosa. The mucosa is made necrotic by lack of blood supply, produced

probably by distension of the gut or by strangulation. This toxic substance when injected into normal animals produces the symptoms of intestinal obstruction and death. (The toxic element has never been isolated from the blood.)

When we remark in regard to a late case of obstruction, that the patient is death-bound before we make the incision, we mean that the lethal dose of this toxin has already been absorbed through a damaged mucosa. Suppose, on the contrary, that in a given case the distended gut has not yet produced sufficient change in the mucosa to produce or to permit only a partial absorption of such toxin. Toxic symptoms are appearing, but not advanced. What then should be the surgical procedure of the operator who has this borderline condition clearly in mind? He opens the abdomen; a coil of discolored bowel is seen among normal coils; this he immediately traces. He finds an adhesive band or a diverticulum constricting the gut; divides this, and inspects the damaged coil. The color gradually changes from plum color to cherry red. What then? The patient's condition is none too good. He shows the effects of the trauma of exploration. Toxic absorption had begun before the operation did. The surgeon concludes that the gut will live and not perforate if he restores it to the abdomen. Will the absorption from this discolored segment of gut cease at that moment when the constriction was released? Will the already partially damaged mucosa no longer absorb the toxic material lying within and upon it? Will the toxic content of the damaged coil in the absence of peristaltic waves following the anesthesia, pass promptly down into normal bowel where we are now-a-days willing to concede that normal mucous will not absorb it? Or will the absorption in the damaged gut probably continue at least sufficiently to increase its toxic effect upon an individual whose resistance has now been lowered by operation and anesthesia?

We have all replaced discolored bowel in such fashion and recovery has ensued. Nevertheless, is

not this one type of case where we gamble with a life merely for the sake of avoiding the nuisances and inconveniences of fistulæ, secondary operation, etc., which would be the sequelæ of any other procedure we might employ? Can we deny that, although replacing the gut in such instances may be successful, the safest gamble for life would be to deliver the discolored gut outside the abdomen, to insert a catheter immediately, and freely to open the gut in twelve to twenty-four hours? There would be no question then as to further absorption of toxic material through a damaged mucosa. A vent would be established for the accumulated gas and fecal material proximal to the original point of obstruction. The relief of distention by the gradual emptying of the distended coils favors the return of peristalsis, the failure of which is always the prelude to disaster

Take another hypothetical example: Suppose the strangulated gut described does not regain its lustre and change of color. It cannot be replaced. Again we assume that the patient's resistance to the beginning toxicity has been reduced by the operative exploration. Resection of the discolored bowel is performed with end-to-end suture. The abdomen is hastily closed—an excellent operation has been executed. An even greater gambling with the patient's life has been perpetrated. It may succeed. If so—no fistulæ—no nuisances—all is well. But even the best surgeon, rapid, nontraumatic and deft in intestinal anastomosis, cannot deny that he stakes his skill against the safer play; namely, to deliver the coil, to empty it with a catheter, to drain it and the distended coil above, to incite the restoration of peristalsis—and to save a life if anything will.

I have referred to the delivery of a strangulated coil to the abdominal wall simply to contrast a safer method with doubtful replacements and resections and anastomoses. I do not mean to recommend the technic as such in all such cases. It is the extreme precautionary measure,—a poor kind of operation for all other

reasons than its element of safety. The interval between the primary operation and the subsequent secondary operation for restoring the continuity of the bowel, an interval perhaps of several months, is a wretched one for the patient, nurses, and surgeon. The care of a fistula of the small intestine with its attending dermatitis and possible emaciation, particularly if this opening is in the upper ileum or jejunum, is trying indeed to all concerned.

Nevertheless, the principle of immediate and through drainage of the damaged, distended, absorbing bowel, within the extra peritoneal safety zone is the one for which I am contending, and any modification of the operative technic which will acomplish this object without the necessity of actually delivering the coil to the abdominal wall, we will all, of course, immediately accept. Such modifications are these for example: The gut is resected, the ends anastomosed; a catheter is introduced proximally to the anastomosis for the drainage of the distended proximal coils. This is the ideal operation for the right man on the right patient. The surgeon must consider two factors,—his own experience and the patient's resistance. Can he do a resection quickly, neatly and tightly? If not, let him resort to the more fool-proof method I first described. Can a given patient in a given state of toxicity resist the trauma of a given surgeon's technic? In determining the resistance of a patient with mechanical ileus and endeavoring to measure his toxicity, we may well resort to certain guides applicable in obstruction which we cannot always employ in other abdominal conditions.

Whipple proves experimentally that the excretory function of the kidney is greatly impaired by the toxin of intestinal obstruction; that a condition similar to chronic nephritis exists, which rapidly disappears after relief of the obstruction. And he aptly suggests "that the nonprotein nitrogen or urea nitrogen content of the blood as well as the kidney function, may sug-

gest a serious intoxication and the necessity of urgent measures."

If this be true, may we not also employ the urea, phenolsulphonephthalein and NaCl tests, not only to complete the diagnosis, but to aid us in determining the degree of intoxication with which the patient is to undergo the insult of the operation, and choose the type of operation accordingly?

Van Buren has recently urged the emptying and irrigation of the bowel above the point of obstruction, regardless of the method employed to relieve the obstruction itself. He believes this can be done before closure of the wound without contamination. I gather that he recommends this whether the operation be a replacement of the original bowel, or a resection, or an anastomosis.

Codman goes so far as to state that a Monks or Monyher tube (a glass tube like a drinking tube) should be inserted in the small bowel above the point of obstruction, and that it should be threaded along the whole length of the gut in order to relieve its distension. He believes that the reward is greater than the shock produced by this much handling of the bowel.

There are types of mechanical obstruction *without bowel strangulation* in which toxins must result from the distension above the point of obstruction. In such cases the cause of the obstruction is a local paralytic ileus from a local peritonitis, as in Handley's so-called *ileus duplex*. In such cases the obstructive point being not removable, must be sidetracked. Here again the choice of method is to my mind the secret of the result. Again it is a balance between the degree of resistance of the patient and the experience of the operator. An ileocolostomy for low ileal obstruction plus a cecostomy when the colon is also obstructed, is the classical technic. Are there not occasions when a preliminary ileostomy is the emergency method of choice instead of an ileocolostomy? In other words, bowel drainage rather than intestinal anastomosis?

Another group of cases with which we are familiar, recover according to the judgment employed in their handling. I refer to the mechanical ileus occurring from five to ten days after the removal of a septic appendix. A paralytic ileus may have immediately followed the operation with apparent recovery. Then neither gas nor fecal matter can be obtained by enemata. The peristalsis is bucking against resistance and may be visible as it rarely is in the routine case of acute obstruction. There is vomiting. It is too early for the formation of an adhesive band. The abdomen is opened and coils of distended small bowel present. Certain coils are plastered together with exudate. The site of obstruction is not visible. One surgeon will explore the right, lower quadrant, handling and separating adherent coils, to find collapsed bowel near the cecum, and perform an ileocolostomy. He adds shock and he may produce new fields for plastic adhesions—obstruction may occur at a new point higher than the anastomosis. On the contrary, the patient may live. Another surgeon will incise in the median line under local anesthesia, insert a tube in the first low coil presenting, and then stop. Ileostomy in such cases of local adhesive ileus, where peristalsis is yet active, will generally relieve the distention; the kinked and adherent coils are likely to become patent when the distention is relieved, and results by rectum are forthcoming within twelve hours. The chances of a strangulated section of gut being present and overlooked in these early postoperative cases are very slight.

Here again, I ask you, do we not gamble less with mortality if we sacrifice our curiosity to localize the obstruction and perform anastomosis, and substitute a simple ileostomy of any type we may prefer? Such fistulæ generally close spontaneously.

The four cases of acute mechanical ileus of the small bowel which I have handled in the past six months will be printed later in detail.

The first was an obstruction from volvulus of the ileum. The operation was early. Twenty-four hours

after onset of symptoms, twelve inches of gut were resected, followed by end-to-end anastomosis. The convalescence to the thirteenth day was satisfactory; recurrence of symptoms of obstruction then occurred. A second operation was done fourteen hours later. There was a local, plastic exudate at the site of the original anastomosis. Three coils were adherent and angulated at this point. Forty minutes were wasted in the separating of these coils and in suturing a bowel tear incident to it. A bowel at the site of the old anastomosis was then delivered into the wound. A catheter was inserted. Immediate paralytic ileus ensued with no response to peristaltic stimulation. Death occurred on the third day. This fatality was probably inexcusable. The local infection was not from a leaking anastomosis, and therefore probably from contamination at the time of the anastomosis; hence the later development, local infection and local ileus. Had I at the first operation resected the bowel and brought the ends out, or delivered the bowel and resected it with a cautery, a secondary operation would have been necessary, but the patient might have been alive to-day.

And again, at the second operation, had I not attempted to relieve the adherent coils of bowel but had incidentally done an ileostomy to the distended coil —then I might have saved the patient.

In the second case another surgeon had removed the right ovary and appendix. A paralytic ileus immediately followed three days after operation, in the presence of marked distension. The wound broke open and the bowel presented. I repaired the wound under gas and oxygen anesthesia. The distension continued with vomiting, constipation, and pain, but without visible peristalsis. I fell into the trap of regarding the condition as a continuing paralytic ileus and delayed four days. Operation: Division of an adhesion band in the region of the primary operation. Bowel not discolored; restored to the abdomen.

I credit the recovery of this case to the luck of strangulation and intoxication. The absorption was sufficient from the distended coils above the point of obstruction to cause definite symptoms of toxemia, and yet they were not sufficient to be fatal. The delay in operating for relief of obstruction was the old, common, but inexcusable one of interpreting the condition as one of paralytic ileus.

The third case: Strangulation of 7 inches of the upper ileum from a band—perhaps the remains of a Meckel's diverticulum. Perforation of the necrotic bowel 1cm. from the constricting band; general peritonitis, fibrin and purulent fluid apparently free in the abdominal cavity. The internist called me on the second day, and then it took me seven days to decide that operation was necessary, in which time I visited and examined the patient twice daily.

Is not this inconceivable? The abdomen was not distended. Peristalsis was not visible. Enemata brought some flatus and some fecal material, but obviously only from the bowel below the obstruction. There were spasmodic pains from the beginning which did not increase in severity and occurred sometimes at intervals of two to three hours. The temperature, pulse and leukocytosis were negligible. It was only because of a slight change in the quality of the pulse that I decided to operate. When the internist saw the contents of this woman's abdomen, I think that he concluded that any subsequent censures which might ever be showered upon him by a surgeon would be met with rebuke.

After dividing the constricting band, the discolored gut was brought out of the wound and sutured, leaving room for a single pelvic drain. A catheter was immediately inserted, and twelve hours later the necrotic bowel was removed with a cautery. Of course there was infection of the wound, but recovery occurred without a hectic convalescence.

The usual dermatitis occurred and it was three months before the skin permitted a secondary oper-

ation, at which time the original wound with the two presenting bowel-ends was excised in toto. The freshened intra-abdominal stumps were then closed and a side-to-side anastomosis performed at the ends. The patient is now entirely well.

This was one of the cases where I employed the more fool-proof technic, as probably most would have done in the presence of general peritonitis. It was the seventh day and yet our mortality statistics show that after the third day there is little hope; little hope, I repeat, for resection or anastomosis, but some hope yet if the simple technic is employed.

Fourth case: Cicatrical adhesive obstruction of the ileum near the cecum. Extraperitoneal ileostomy with recovery. A women of forty-three who had been operated on by another surgeon for cancer of the cervix by the Percy cautery method. A vesicovaginal fistula had resulted. Three months after the operation, obstruction of both ureters occurred either from recurring carcinoma in the bladder wall, or from cicatrization following the cautery burn. I performed a left nephrotomy as an emergency to relieve the urinary obstruction. Five months later I removed the opposite pyonephrotic dead kidney. Prior to this operation there had been occasional lower, right abdominal pains with visible peristalsis.

Two weeks after the nephrectomy, the symptoms of obstruction returned in an acute form. Seventy-two hours were allowed after the diagnosis was made to see if the bowel might again become patent, since a patient with a vesicovaginal fistula, a nephrostomy fistula, recurring carcinoma, and convalescent from a recent nephrectomy, was one entitled perhaps to delay; in fact a fourth intrusion upon the efforts of Nature to end this woman's life was reluctantly decided upon.

A phenolsulphophthalein test was made from the left nephrostomy tube, which showed a normal function. Through a medium incision, the right iliac region was hastily palpated, revealing collapse of the last portion

of the ileum. The obstruction was apparently not from recurring growth. A low, distended coil of ileum was brought into the wound and sutured there. A rubber tube was inserted and twelve hours later the bowel was opened freely.

This patient recovered from the operation, and is, I regret to say, alive to-day, four months after the last operation. Next week I propose to close the ileostomy and probably due an ileocolostomy.

Of the four cases then, three have survived, although I should not claim a 25 per cent mortality until after the secondary operation to be done on the fourth case. The only case which was operated upon within the first three days, died. Late cases, then, may yet be saved. As to the symptomatology: Pain, vomiting, and constipation were present in all four cases. Visible peristalsis was present in but one.

I believe that the performing of ileostomy in two cases explains their recovery, and that any further operative procedure would have killed both.

Had I performed simple ileostomy at the time of the late, secondary obstruction in the only fatal case, I believe that my total mortality would have been zero.

In conclusion, then, may I reiterate my contention that the persistently high mortality in the surgery of acute mechanical obstruction of the small intestine is due in part to delayed diagnosis, but more particularly to errors in judgment as to the proper surgical technic to employ in a given case; and this error consists primarily in an over enthusiasm for radical measures, such as resections and anastomoses, and an unjustifiable reluctance to employ ileostomy alone.

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DISCUSSION

Dr. Roland Hill (St. Louis, Mo.): I think this paper has been exceedingly valuable. The great question is, when should we do the resection and when simply drainage? To my mind, if there is any doubt, we should open the bowel.

There is another point and that is the question of anastomosis. I think that a lateral anastomosis is much safer than an end-to-end anastomosis, and a mechanical device is rarely needed.

I wish to report one case from my service some four years ago. The patient was a nurse, who had been operated on by a friend twice for appendix trouble. After the second operation, she developed very acute bowel obstruction, enterostomy

with drainage was found necessary, and a tube put in. My friend was called out of town and she came under my care. Evidently the enterostomy was high up, and the stomach much dilated, for, when she took food, it appeared in the wound in fifteen minutes. She was losing two pounds a day. The whole surface of the abdomen was in a horrible state from contact with secretions. Under this condition I reopened the abdomen and did a lateral anastomosis. The obstruction was found below this point and released, and drains inserted. The patient was very ill for a time, but ultimately made a very satisfactory recovery. It is one of the cases that shows what may happen when a very high opening is made into the bowel.

Dr. Frederick G. Dyas (Chicago, Ill.): It might seem that there is nothing left to be said. I think the ground is well taken. When one stops to consider the procedure in the examination of the chest, it seems to me that the surgeon shows that his training is along the lines of surgical technic. So many times you see surgeons, when they are called in to see a case, go right in to examine the abdomen without making a thorough examination of the patient. Every surgeon who does a considerable amount of work is going to open the abdomen many times a year. There are instances in which he may avoid those mistakes. As Dr. Van Hook used to say, "Do not think that all the symptoms that you find in the abdomen are caused by the lesions below the diaphragm."

Dr. Herman E. Pearse (Kansas City, Mo.): If we do an external ileostomy we have to close the ileum opening. It seems to me that, when we have emptied the ileum, if we pass a tube quickly into the rectum and find the most available point of the sigmoid, where an anastomosis can be done without tension, and then put in a Murphy button, we can have the fluid pouring out through this rectal tube.

Dr. Guy Cochran (Los Angeles, Calif.): There has always been one thought in the back of my head in connection with these cases, and that was an early teaching, that after eight hours the mortality is 80 per cent.

Of course that was before the days of tube drainage, but it has been of value to impress upon me the imperativeness of early surgical intervention.

The great majority of these cases are at least twenty-four hours old when the surgeon is called, and many have had all sorts of medical treatment.

In a great number the onset is so abrupt and so absolutely characteristic that failure to recognize and act immediately in this group is unforgiveable.

Dr. Robinson speaks of end-to-end anastomosis. I have felt that in the small intestine it is wiser to use the side-to-side, and have always followed that technic, feeling that the few minutes longer consumed are well repaid by greater safety over the end-to-end method.

In fact, the last case of acute intestinal obstruction I have operated on was in the lower ileum at the point of suture, where a very competent surgeon had made an end-to-end anastomosis six months before.

I truly believe that the tube saves many lives of the late cases.

Dr. Robinson's paper is a most excellent one, and upon a most important subject.

Dr. H. B. Sweetser (Minneapolis, Minn.): In the presence of acute obstruction of the bowel there can be no question but that the emptying of the bowel contents by the formation of a fistula, with no attempt to remove the cause of the obstruction, is often a life-saving measure. By taking the first loop of distended bowel which presents the opening can be done quickly with no handling of other coils, and no anesthesia is necessary. If the bowel wall is well invaginated around a tube by two superimposed purse-string sutures, and then attached to the parietal peritoneum, there will be little danger of contamination, and the fistulous tract will promptly close when the tube is removed.

In making an end-to-end anastomosis, if the bowel wall is cut quite obliquely, the blood supply is conserved so as to obviate the danger of necrosis. At the same time the opening is thus made sufficiently large to prevent later stenosis at that point.

Dr. E. P. Quain (Bismark, N. D.): I am in accord with the statement that the most important part of the treatment of obstruction in most cases is the emptying of the afferent intestine. In order to avoid the inconvenience and distress of prolonged leakage following the drainage of a loop of the small intestine, I have adopted the following technic: A good-sized catheter, with the tip cut off, is inserted into the bowel by the Witzel method. A fold of omentum is then

sutured around the catheter so that the intestine will lie some distance away from the abdominal wall. When the catheter is removed, after a few days, this fat cushion tends to close up the sinus at once. The intestinal wall also is in a movable situation and the fistula is not held open. On the other hand, when the opening in the intestine is contacted with the abdominal wall, adhesions form between these two structures, and the fistula is held open by its unyielding fixation. Sometimes the omentum is not available at the point desired, then the side of a loop of large bowel may be utilized as an intermediary between visceral and parietal peritoneum. In case of necessity it is perferable even to let a loop or two of the neighboring small intestine form adhesions about the catheter rather than to pull the enterostomy up to become fixed to the abdominal wall.

Dr. William T. Coughlin (St. Louis, Mo.): I have had the experience in private practice of not seeing many cases of acute intestinal obstruction. In the last few years in a Southern hospital we were never without a case of acute obstruction. Nearly all of them showed peristalsis, and that is because we did not get them until the third day. I am not at all proud of our successes.

My great difficulty with cases desperately ill and likely distended, is that as soon as I make an incision in the abdomen it is hard to keep the intestines from coming down unless they have been emptied first. Any operation for intestinal obstruction that does not empty the distended bowel is incomplete. Some of my colleagues advocate the glass tube. I have seen it used by them and have tried it myself. None of those patients did well. It took a lot of time.

John Young Brown was a strong advocate for the emptying of the bowels. With catheter it takes quite a while for the gas and feces to come up, and time means a good deal. Then the abdomen cannot be very well closed unless distension has been relieved. I find that it takes so much time for the escape of gas and fecal matter through the catheter, that I abandoned it, but for a time I was very keen about it. In one case I pulled out a loop, and I think about three-quarters of the small intestine was out on the bed. I have had other cases since then that died after having pulled out a loop.

In going over the cases, and in asking patients questions, I have tried to find, so far as possible, something to pin my faith on, so as to make an early diagnosis in cases of intestinal ob-

struction. All complain of pain as a first symptom, and it has a special character. It is not a sharp pain, but a sort of colicky pain that makes them sick at their stomach. The patient, after that pain, begins to vomit and has severe pain and feels like vomiting before he actually vomits again. That sign is a very important one at the onset of the condition, and the pain produces nausea.

I would like to refer to the fact that it is said there is always constipation, but I have not found that to be so. It is very hard to make the diagnosis. There are cases that have apparently normal bowel movements for two or three days after the onset of the trouble, and that I have seen especially in two cases that were due to gall-stones. I think that is the worst form of intestinal trouble there is.

THE REPORT OF A CASE OF ATRESIA OF THE ILEUM WITH MICROCOLON

MAURICE KAHN, M. D., F. A. C. S.

LOS ANGELES, CALIFORNIA

The following case is of sufficient rarity, I think, to justify recording:

I was called to operate for congenital intestinal obstruction on a male infant forty-eight hours after its birth. The baby seemed normal at birth, but soon it was noticed that it vomited everything given within a few minutes of its ingestion. No meconium had passed since birth, which, in the opinion of Dr. F. C. Ainley, the obstetrician in the case, indicated an absolute obstruction, due probably to some congenital deformity. The abdomen was distended, with visible coils of intestine, though peristalsis was not discernible On account of the distention of the abdomen with gas, and its being intestinal and not gastric, Dr. Ainley concluded that this must indicate that some material had passed through the pylorus, which would eliminate pyloric or duodenal obstruction. Dr. Henry Dietrich, the pediatrician who was called in consultation, was of the same opinion as Dr. Ainley. A proctoscopic examination made with a cystoscope failed to reveal any abnormality for a distance of three inches from the anus.

Operation was performed. The abdomen was opened by a left paramedian incision with the umbilicus at about its center, large enough to explore the entire abdominal cavity. Immediately distended coils of small intestine protruded, and no effort was made to restrain them. They were caught in hot towels and well protected. The following condition was then noted; The small intestine was normal aside from the distention, except the terminal six inches of the ileum which showed a marked contraction in such a

manner as to duplicate almost exactly in feel that of a string of beads. This contracted portion was about the size of an ordinary lead-pencil, did not dilate under rather harsh manipulation. It ended blindly, that is, it was not united at all to the cecum. The entire large intestine as far down as the sigmoid was represented by a tube about three millimeters in diameter and looked like a small white cord. The sigmoid was a trifle larger, and the upper rectum about eight millimeters in diameter. The cecum was in the right fossa, and the entire large intestine was normally placed with normal mesocolon throughout its course. Prior to the operation the father of the infant stated to me that he very much desired a healthy child, but, if the abnormality were such as would greatly handicap the child, then he preferred its death. While the outlook was not at all bright in the event of further surgery being performed, yet in deciding what course to pursue I asked myself what I should wish done if the child were my own, and I answered by closing the abdomen without making any effort to corrective surgery. The child died fifteen hours later.

Jeffries (British Medical Journal, April 5, 1913, 712) reports a case in which the large intestine from the cecum to the sigmoid flexure was represented by a white, thin, cord-like band. The cecum was distended. The lack of patency of the larger gut appeared to begin about one inch from the colic end of the cecum.

Beer (Annals of Surgery lxi, 1-116, January, 1915) mentions the case of a three day old female child which showed the entire colon about the calibre of an adult ureter.

Sturgis (Surgery, Gynecology and Obstetrics, xxi, 4—447, 1915) reports a case of atresia of the jejunum.

Perry (Lancet, cxcviii, 318, 1920) reports the case of an infant eighteen hours old, operated on for obstruction. The small intestine ended blindly ninety-five centimeters from its origin.

Mayer (British Medical Journal, 498, March 8, 1913,) reports the case of a Hindu infant three days old, which presented an ileum ending blindly, free of mesentery for its distal six inches. The large intestine, including the rectum to within an inch of the anus for for which distance it was patent, was represented by a whitish, thin, cord-like band in the whole of its course. There was a mesosigmoid, transverse mesocolon, and a minute appendix.

Gallert (Lancet, cxcviii, 912, April 24, 1920) reports the case of a child five days old wherein the large intestine was represented by a pale contracted band which would admit only a moderate-sized probe. From the diminutive cecum downwards the colon was markedly attenuated and poorly developed in a gradnal decline, especially marked below the hepatic flexure.

Vander Bogart (Archives of Pediatrics, xxxv, 1-45, January, 1918) reports the case of an infant in which the small bowel ended abruptly twenty-five inches above the ileo-cecal valve. There was complete absence of the gut for one-half inch, and both the small and the large bowel below the obstruction were poorly developed. No fibrous cord intervened between the two portions of the gut.

The more common anomalies of the intestinal tract are not difficult to comprehend. Having in mind the normal development of the intestinal canal, enables us by assuming arrested progress at a given stage satisfactorily to explain the anomaly found.

It will be recalled that about the sixth week of intra-uterine life the colon begins to be differentiated from the small intestine The cecum first appears as a ventral protrusion of the alimentary tube. As the alimentary canal increases in length it forms a U-shaped loop, the distal loop of which forms the colon. At the third month this loop twists around from right to left, so that the portion of the loop which is later to be the splenic flexure is carried upward and

to the left toward the splenic region, where it adheres tenaciously. At this time the cecum lies at about the center of the abdomen, while the remainder of the colon lies as a curved tube in the left hypochondriac and left iliac region attached by a mesentery to the front of the spine. A little later, the cecum and upper part of the colon are carried upward and to the left and, later still, over to the right, so that the cecum then is found under the liver in the right hypochondrium. Finally the cecum descends toward the right iliac fossa, and at the eighth month is at or below the iliac crest.

Thus we may have development arrested anywhere from complete nonrotation of the colon, with the large intestine occupying the left abdominal cavity and the small intestine occupying the right abdominal cavity, with the ileum entering the cecum from the right side, to arrested progress anywhere in the line of its developmental transit—for example, the cecum may be found just under the liver, with absence of the ascending colon, or midway between the liver and iliac fossa, etc.

As to the genesis of this type of anomaly there is an unanimity of opinion; but not so of the stenosis and atresiæ, in which many theories have been advanced to explain their origin, namely: one, intra-uterine volvulus; two, embolism or thrombosis of the superior mesenteric vessels; three, pressure from tumors or from amniotic bands; four, traction of omphalo-mesenteric duct or its hyperinvolution; five, intra-uterine peritonitis; six, persistence of the epithelium occlusion and ingrowth of the mesenchyma.

In the case herewith reported there was no evidence, such as twists, bands, agglutinated coils of intestine, etc., supporting any of the foregoing theories. It seems to me that with the exception of the epithelium occlusion theory all of the foregoing postulations may be discarded as more or less fanciful hypotheses unless post-mortem findings supply the evidence. Moreover, there is assumed in the foregoing theories, except the

last one, prenatal pathology, which is a repellant explanation to the scientific investigator, whereas an evolutionary theory is attractive and is respectfully entertained.

Having recognized that the duodenal lumen in young embryos is normally completely obliterated by epithelium forming a solid cord of cells, Tandler (Morph. Jahrb., Bd. 29 S. 187, 1900) concluded that sometimes this atresia may persist and may be found as a congenital occlusion or stenosis. Forssner (Anat, Hefte. Bd. 34 S. 1, 1907) found that in early embryo the lumen of the duodenum was completely obliterated in places. This normal epithelium occlusion of the duodenum disappears by a process of disintegration leading to vacuolation. Forssner thinks that this epithelium occlusion may take place throughout the small intestine. Taudler considered that the cause of the occlusion was the resistance exerted upon the expanding epithelium by the surrounding mesenchyma. Moreover, when the epithelium occlusion is followed by sufficient ingrowth of mesenchyma, complete mesenchymal occlusion occurs, and this condition may be permanent. Or, by subsequent changes a stenosis may develop or valve-formation occur.

DISCUSSION

Dr. Byron B. Davis (Omaha, Neb.): I wish to report a case I saw a few days ago. The patient lived three or four days and died. The small intestine looked like a string of beads. I suppose this is rare, but I feel the case is of enough importance to deserve mention.

Dr. H. B. Sweetser (Minneapolis, Minn.): At St. Mary's Hospital we have had two similar cases in the past two years, in which the small intestine ended abruptly, one in my service and one in the service of one of my colleagues. In both the bowel was quite large above the hiatus, but very small below. In my case I made a side-to-side anastomosis, without relief of the symptoms of obstruction, and the child promptly died.

My colleague had a different idea. In his case he made an enterostomy in the proximal portion of the intestine, with the hope that, if the child lived, the distal portion would develop so as to allow a later anatomosis. This I think was the proper idea, but, unfortunately, this child also died promptly.

WHO'S WHO IN THE HOSPITAL? AN ATTEMPT AT CONSTRUCTIVE CRITICISM

H. G. Wetherill, M. D., F. A. C. S.

DENVER, COLORADO

None of the schemes for "hospital standardization" contemplates the consideration of that which is fundamental and basic in the correction of the worst feature of hospital maladministration.

All attempts to standardize hospitals and to establish in them scientific procedure, orderly methods and coördinated endeavor for the attainment of better results must depend primarily on the measure of success each hospital has in organizing and amalgamating the *whole* working force of the institution.

In a "closed hospital"[1] with a relatively small and carefully chosen staff of well-trained and efficient medical men, such organization and standardization are easy of attainment and are to be expected as a natural consequence of the favorable factors presented. Careful case recording, laboratory facilities, necropsy study, and coördinated diagnostic, therapeutic, and research methods should prevail.

Unfortunately, however, there are comparatively few such hospitals in America, and of the "open hospi-

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1. The term "closed hospital" is here used in contradistinction to the term "open hospital" in deference to the accepted meaning of these terms as established by usage. They are both objectionable and convey erroneous impressions and, like the term "general hospital" are construed to mean that which they were never intended to mean. When hospital standardization ideals are realized, if they ever are, all hospitals will be "open hospitals" for those who apply and can qualify for practice in them, and there will be no "closed hospitals."

tals" only a relatively small number are so conducted as to be controlled or dominated by a group of highly trained and scientific men, even when such are available on the staff of the hospital.

The prevailing type of American hospital is the unendowed commercial "open hospital" into which any and every "reputable" physician is free to bring his patients for such treatment or operation as he may be pleased to direct and execute. How "open" such hospitals are, and how unrestricted the operations of the "reputable practitioners," we all know. In the vernacular of the race track it could be described as a "free-for-all, go-as-you please" competition in which the "brilliant performer of unnecessary operations" is likely to be the winner. Even osteopaths, chiropractors, and advertising quacks sometimes have the entrée to such "open hospitals," and abortionists may use them to clear away the débris retained after an incomplete office operation.

Thus, under the protection and implied guarantee of safety, the hospital holds out to its patients, the unattached and irresponsible "reputable" practitioner finds in its open door an invitation to attempt those things for which he has had little or no special training and for the safe conduct of which he is totally unfitted. He has none of the benefits of staff membership, if there be any, and he is free from all restraint and is responsible to no one for his conduct or his results. Case recording, laboratory facilities, and coördinated diagnosis, therapeusis, and research may never mean anything to him, and no refinements of hospital standardization can be brought to bear on him so long as he remains outside the hospital organization and is totally irresponsible to it and uncontrolled by it.

It is absolutely essential as a fundamental basis for progress along the lines of better hospital organization,

which may some day lead to standardization, first to control and govern this disassociated, irresponsible, and unorganized element in the existing hospital system.

What good could come of it if every hospital in the land were to be given in a night all the facilities prescribed by the most rigid requirements of the most highly idealized standardization program extant if its execution and operation depended on such an unassimilable and untrained personnel?

Candor compels us to admit that it is going to be next to impossible satisfactorily to standarize our hospitals along the simplest lines if the staff alone of each hospital is to be considered. It will require years of work to inculcate and implant the principles of hospital standardization into the minds and methods of those already within the hospital organizations, though they probably represent the better and most advanced element in the medical profession. To do this for those outside the hospital organizations, those on whom no influence or control can be directly exercised, would appear to be quite impossible.

If, then, we must reach and bring within the sphere of influence of the organized and standarized hospitals this detached and irresponsible element, and I believe all who consider this intricate problem will concede that this must be done, for they cannot be ignored or left without the organization, how should it be accomplished?

HOW TO REACH UNATTACHED, OUTSIDE PRACTITIONERS

In many instances, in every large city where there are "open hospitals," some of the most capable and able physicians and surgeons in the community practice extensively in some hospitals with which they have no official connection or tie of any kind. They would

in many, indeed in most of such instances, welcome any plan that would include them in the scheme of official association with such hospital. That such recognition has not been accorded them in the past is due to the crucial failure of the system, or lack of system, on which most American hospitals have been founded; for it should always have been a fundamental principle of organization and control in all hospitals that no physician be allowed to practice in them till he had formally been accorded the privilege.

Furthermore, his application for admission as an "approved," "associate," or "visiting physician" should have been accompanied by a detailed statement of his personal history and educational advantages, his special training and professional associations, and other personal data that would be pertinent.

His application should have been passed upon by a committee of officials of the hospital on which the medical staff should have adequate representation, and if his application is favorably acted upon he should be granted a *revocable permit* to practice in the hospital.

Late as it is, formidable as the obstacles seem to be and are, this is the plan that, in our opinion, should now be universally adopted to create a foundation for satisfactory individual hospital organizations and universal hospital standardization.

Some such plan as this for reaching and bringing within the sphere of influence of this standardization movement these detached but essential elements will have to be adopted, or a considerable and important part of the working hospital personnel can never be reached or influenced in any way.

BASIC FACTORS IN STANDARDIZATION OF HOSPITALS

It has been said many times that the standardization of hospitals and the standardization of physicians and

surgeons must go hand in hand, and that the advancement of one of these necessarily implies the progress of the other; but this can be true only if their interdependence is closely tied together and if consistent effort is made to bring within the fold all surgeons and all hospitals that present evidence of qualifications that should entitle them to recognition.

Once established, such a system would soon create for those hospitals and those surgeons who conformed to its requirements a prestige that would compel the compliance of all the others. The history of the reorganization of medical education in America would be repeated, and the standardization of American hospitals would then be a readily solvable problem.

In 1918 I presented a resolution at the annual meeting of the staff of two of the Denver hospitals with which I have long been connected, in which it was set forth that it was the sense of the staff that no one should be permitted to practice in the hospital till he had made formal application for the privilege of doing so and his application had been favorably passed upon by the proper board or committee of the hospital.

I subsequently prepared and submitted a form of application blank as a basis of operations, but in neither hospital was any effective action taken, though the resolution was unanimously voted by the staff at its annual meeting (the only meeting of the staff for the year, by the way, in each instance). A copy of the application form is given herewith as a guide to the preparation of such forms for other hospitals.

It is a pertinent commentary on this state of things that within the last year in each of these hospitals serious consequences, and in one instance a fatal result, followed the grossest and most inexcusable malpractice at the hands of "outside operators" who had been permitted to use the operating-room without the know-

Date.....192.....

APPLICATION FOR PERMISSION TO PRACTICE IN.....HOSPITAL AS AN "APPROVED ASSOCIATE PHYSICIAN"

Name in full.....
Residence .....
Office .....
Date of your license to practice in Colorado?.....
In what states other than Colorado have you practiced and between what dates?.....
.....
Date and place of birth.....
When and where were you graduated in medicine?.....
.....
Other degrees taken.....
Hospital, college and other appointments, interneships, etc., ...
.....
.....
Specialty .....
Postgraduate Courses.....
.....
Associated with or assistant to.....
.....
How long? (Give dates).....
Past clinical laboratory and surgical opportunities.....
.....
.....

In accepting the privileges and facilities of..... Hospital for my patients, to be treated or operated on by me, I agree to be bound and governed by all the rules and regulations of the hospital and all regulations made for the government of its medical and surgical staff.

I shall accept the appointment as an approved associate physician or surgeon of the hospital if it is offered me, subject to revocation and cancellation on ten day's notice if for any reason at any time the executive board of the hospital deems it desirable or necessary to revoke and cancel this permission to practice in the hospital.

Approved.....192.....

....

....

Committee

This application must be accompanied by two letters from reputable physicians certifying to your ability, character, and habits.

ledge or consent of any physician or surgeon connected with either hospital. How many other such instances there may have been during those two years since the staff "solemnly" and unanimously resolved that such things should not be, I do not know. The foregoing details are given solely because I believe that such conditions are not peculiar to Denver, but are common elsewhere; indeed, one might almost say everywhere throughout the United States.

Staff meetings once in each year and the lack of coördination this implies within the hospital organization, and the "open door" for "outside operators" must be considered as primary basic defects in any scheme of hospital standardization. Nothing, nothing whatever, can be done to standarize anything on earth till such fundamental fallacies are eliminated.

Again using my own city as an example, merely because it probably is typical of many others, it is significant that the one hospital in which monthly meetings of the staff are held and in which some approach to the established standards of the American College of Surgeons is attained, is the only closed hospital in the city, that is, its patients are all under the care of members of its staff. This is the more remarkable as it is the one hospital in which all citizens of Denver may be said to have a proprietary right and in which chiropractors and other quacks might without impropriety set up a claim for equal privileges with others.

The Hospital of the City and County of Denver is far from being what it might be, and should be, in many respects; but *it is a closed hospital,* and the responsibility for any maladministration and malpractice that does occur there can be fixed and fastened where it belongs.

It is interesting to remember in this connection that there are county hospitals in which osteopaths and per-

haps other sectarian faddists practice and have represention on the staff and among the force of hospital internes.

The remedy for such an evil is so obvious that I refrain from mentioning it.

ADVANTAGES OF THE CLOSED HOSPITAL

It is evident to every one who has been in touch with hospital conditions, East and West, that the "closed" hospital is the better hospital in all respects. Its administration is easier and better, it may be more economically operated because of the simplified and standardized requirements of those who work in it, and, most important of all, the results are better and the mortality is lower.

Such careful scrutiny of those who are to be permitted to practice in the hospitals as is here proposed, the exclusion of those who are incompetent or unfit to do so, and the check a revocable permit affords will, in the end, convert the "open hospitals" of to-day into the "closed hospitals" of tomorrow, and the service and results should be greatly improved as a consequence of the change.

A PRACTICABLE PLAN

While criticizing conditions as they are, I have endeavored to point a way in which the worst of them may be corrected. I am firmly convinced that all efforts at standardizing hospitals must fail if effective measures are not first employed to reach and bring within the sphere of influence of such standards as may ultimately be adopted the unattached outsider who now has all the privileges of the hospital and none of the responsibilities and restraints imposed on the members of its staff. I am, therefore, indulging in a form of constructive criticism that should serve to eliminate the evident faults and at the same time furnish a foundation on which a substantial and enduring super-

structure of standards for hospital unity and uniformity may ultimately be erected.

The effort for hospital standardization must contemplate as a primary and fundamental factor of its foundation the inclusion of *all* those physicians who are permitted to work in hospitals; and each of them, not excepting the members of the staff, should be required to place in the archives of the institution some statement such as is suggested in connection with this paper. For reference and for record such a statement would have great value, and none who work in the hospital should be excused or exempted from filing such a record regarding his history and experience; for, if the members of the staff file such a statement, it becomes much easier to demand that others do so.

Permits to practice in a hospital, or appointments as associate or attending physicians, should be made revocable for cause, thus providing a double check on incompetence and unscrupulousness, the check on entry and the implied or impending revocation of the privilege accorded if the work or conduct of the individual is not what it should be.

All of this may appear to be utopian and impracticable. I have considered it carefully a long time and I do not think it so. I believe that if once inaugurated and made effective through the agency of the American College of Surgeons or the American Medical Association, it is workable and practicable and that it offers the key to the standardization problem. If, in addition to, or as a sustitute for, action by each hospital there could be in each state or each city a body representing all the hospitals, as I suggested many years ago,[2] the whole problem could be simplified.

One detail is essential for success, and this you may deem the most utopian dream of all, for it involves the

2. Address of the President of the Colorado State Medical Society, Colorado Med., October, 1906; A Plea For Higher Hospital Efficiency and Standardization, Surg., Gynec. & Obst., June, 1915.

integrity of purpose and the unbiased and unprejudiced action of all of those who pass upon and approve the applications of applicants. There is, however, a much broader and more liberal spirit among medical men than there used to be, and it is not unreasonable to hope that such a plan as is here proposed could be fairly, justly, and equally administered.

DISCUSSION

Dr. Lewis H. McKinnie (Colorado Springs, Colo.): We have been through the throes of organizing our own staff. In Colorado Springs we have a Catholic hospital with a Sister Superior in command. We have in operation such a plan as Dr. Wetherill has outlined. We have classified all of the men known to us by a committee of six in coöperation with the Sister Superior. In Colorado Springs we are bothered a good deal by the tramp physician and surgeon, as well as by the walking delegate for the nurses union. There had to be some way to control this drifting population.

The questionnaire is as strict, or more strict, than an application to get into the Army. We ask the man's name, birthplace, age, education and medical education, the specialty he wishes to practice, and experience he has had in that specialty. Then he is asked to appear before this Board. After that has been done, if he qualifies, he is given a privilege to have patients in this hospital, and the Sister Superior depends upon the recommendation of this Board. Then after he has been proved to be fitted to practice his specialty in the hospital, he is given a copy of the rules of the institution and asked to sign them before he is permitted to do work in the institution. These rules cover all of the standards of the American College of Surgeons as to the keeping of complete records, bringing up the full record of the cases, laboratory and clinical, *x*-ray, etc. Also in this rule is the declaration similar to the one of the American College of Surgeons, and after he has signed that he is allowed to work.

We have then his signature, his application, and his qualifications; and if he does not know these rules he has signed them and has agreed to abide by them. In this hospital it is working very well.

The principal snag we have struck so far is the classifying of the older men who have never gone into any special line,

but do everything. It is possibly a little hard to prevent doing an injustice to these particular men, but we are getting this smoothed out, and we have divided the different specialties into groups.

The hospital about which I am speaking has been a wide-open hospital. Any one who came to town could have a patient in that hospital. Our blanks are rigid and our rules are definitely worked out, and physicians are required to sign all of these before they can work there.

Dr. Harry M. Sherman (San Francisco, Calif.): In some of our hospitals in San Francisco we have what may be called a double staff. There is, in the first place, the regular staff, appointed by the hospital authorities. This staff treats, primarily, the hospital patients,—the no-pay and part-pay ward patients. Its members have, of course, full access for their patients to the private rooms. Then there is the private-patient staff, composed of men who are not appointees of the management, but who wish to use the hospital for the treatment of their personal patients. Applicants are admitted to this staff by the vote of the regular staff. A surgeon wishing to place a patient in the hospital, applies at the office for accommodations. He is given them, and is asked if he wishes to have his name listed on the private-patient staff. If he says "yes," his name is sent to the regular staff for action. Affirmative action admits the applicant to the private-patient staff, and all of his patients to the hospital. Negative action by the staff bars the applicant and his patient from the hospital.

We also find monthly luncheons useful—a most informal lunch, a fairly informal talk, with the formal passing of motions on occasions, and a union and exchange of ideas about hospital management and each other, which is very enlightening. I am sure these luncheons bring people closer together on subjects of common interest than any more formal discussion could do.

Dr. Stanley P. Black (Pasadena, Calif.): Everything in the hospital is for the patient and only for the patient. The Board of Directors are responsible for the welfare of the patient. Any surgeon or any committee of surgeons who say to this operator, "You cannot do this and you cannot do that," so acts because of jealousy. In the hospital in Pasadena, which we have built by public subscription, Dr. Lockwood has had a campaign in which he has raised $600,000. The public have a right in the hospital, and the staff and directions are responsible for that care.

We have a semi-open staff. Every man who brings a patient there much be vouched for by two members of the staff. We have two staffs, an official staff and an attending staff. I have been trying to have the official staff have a committee who should be responsible to the staff for the welfare of the patient. That committee should be formed from the consulting staff. There should be in the hospital a committee which could be called upon at any time to see any inefficient work, and, if inefficient, the surgeons should be dismissed from the hospital. It is necessary to have such a committee although one would never like to belong to it. We must all remember that the best treatment is for the patient. The hospital should be open to all competent physicians and surgeons, but, as I say, all under some kind of supervision.

Dr. Henry R. McGraw (Denver, Colo.): The question of discriminating against a licensed physician in a public institution from the medicolegal standpoint is a very important one. An easy and diplomatic way in which to handle these cases is not to have a room to accommodate their patients.

Dr. St. Elmo M. Sala (Rock Island, Ills.): The by-laws of the hospital at Rock Island, Illinois, governing adjunct staffs say that "no operation can be performed in St. Anthony's Hospital by a member of the adjunct staff of said hospital without one or more members of the active staff being present."

Dr. H. B. Sweetser (Minneapolis, Minn.): At St. Mary's Hospital we have adopted the following method of standardizing the doctors who practice there, and it has so far worked fairly well in discouraging undesirables. It is decidedly an open hospital, for, in checking up, we discovered that over a a period of three months one hundred twenty-five different doctors had averaged only one patient. The Mother Superior decided it was unwise and not feasible to deny patients on the plea of having no vacant bed.

Our method is to invite most of the men who have the privilege of our hospital to our monthly meetings and have certain histories read at the meeetings and discussed openly. It is not very long before some of the doctors are perfectly willing to take their patients to some other hospital where they are not liable to be criticized, or to have their cases watched so carefully. Every doctor enjoying the privileges of the hospital signs our rules, one of them being that the doctor in attendance must write a history, record his physical find-

ings, make notes of the progress of his case, record a working diagnosis, and sign his chart with his final diagnosis before the patient leaves the hospital.

We have a regular staff made up of men who are practicing specialties, and from this staff is elected an advisory board which has control of the medical activities of the hospital and shapes its medical policies. In a few cases the treatment has been so bad, or rather so criminal, that they have been submitted to the Advisory Board for investigation, and the physicians having these cases have been debarred from the privileges of our hospital. This we did under legal advice, and the cases were apparently so badly taken care of that the physicians have been apparently unwilling to sue us for fear that their bad technic and methods, being exposed in the court records, might interfere with their future practice. As I have said, so far this method has worked fairly well in keeping out the very undesirable doctors.

Dr. William T. Coughlin (St. Louis, Mo.): St. John's Hospital, St Louis is an open hospital. In the past there were no staff meetings. Father Moulinier of the Catholic Hospital Association says that, if a patient who comes to the hospital dies, he does not get what he comes for. No patient gets to the operating-room without a history and physical examination. The histories of those who have died are taken up, and when a man dies his history is read and discussed. It works very well.

I am sure it is the experience of most of us that when a man is a clever technician, but an undesirable person for other reasons, it is a hard matter to eliminate him. It is hard for the sisters and the lay people to understand why a man with such success is not desirable.

Dr. Wetherill (closing): What I am appealing for is system, standardization. The discussion has proved one thing, and that is, there is no standardization, no system. The plan of allowing any man to come into a hospital unvouched for, to discover afterwards whether he is doing good or bad work, and then, in some indirect way, telling him he cannot come again, does not meet the requirements of the standards I would establish.

LAMINECTOMY FOR MENINGITIS

Roland Hill, M. D., C. M., F. A. C. S.

ST. LOUIS, MISSOURI

The advisability of laminectomy with free spinal drainage in certain classes of meningitis is a question that seems worthy of our careful consideration. While no principle in surgery is more deservedly recognized than that of establishing an ample outlet for purulent inflammatory products, still in the cerebral and spinal inflammations we have special and very vital factors to be considered.

The cerebrospinal fluid is a most important secretion that practically forms a water bed for the small brain[1]. It is estimated that the normal secretion is replaced every three or four hours by an entirely new supply, and in abnormal conditions, as fracture or lumbar puncture, the alteration in normal tension may result in a very rapid increase in the normal amount of the secretion.

Acute meningitis, especially when of streptococcus or of staphylococcus origin, is a very fatal disease. Netter[2], in a study of 65 cases, found that 54 died within four days. Death is the result of two factors: increased intracranial tension and toxemia. The first factor can be influenced by lessening the cerebrospinal fluid by means of lumbar puncture or by the establishment of open drainage. The factor of toxemia may possibly be influenced by the dilution of the toxins through the rapid secretion of cerebrospinal fluid.

The principal objection to laminectomy along with the operation of cerebral decompression has been made by Dr. Cushing. The objection raised is that purulent products in the base of the skull are sooner or later blocked off, thus rendering a spinal opening useless.

That this objection can not always be sustained is proved by the experimental work of Barr[3]. Barr

trephined a patient who had died from meningitis and then did a lumbar puncture leaving the cannula in place. The lateral ventricles were then tapped and a solution of methylene-blue allowed to flow into them under low pressure. The fluid was observed to escape through the lumbar cannula, showing that in this case at least the normal channels of the cerebrospinal fluid were not blocked. Barr repeated the experiment in a case he had operated on as a last resort, and, although the patient died, he was able to prove conclusively that the normal channels were open.

Dr. Downes reports a case of a boy of twenty-one who was admitted to the accident ward of the New York hospital on November 2, 1912, suffering from a linear fracture of the left parietal region two and one-half inches long. Eight days later he developed a marked meningitis with an increased blood pressure, Kernig's sign, and marked leucocytosis. Occipital decompression was done without delay. A bone flap three and one-half inches by two and one-half inches with its base just above the foramen magnum was made with a Kenyon saw and turned down, exposing the posterior lobes of the cerebrum and cerebellum. The dura over the cerebrum was incised on both sides. There was an escape of one-half ounce of fluid from the left side. Incision was made through the dura of the cerebellum and some fluid escaped. Rubber dam drains were inserted and brought out through drill holes at the angles of the bone flap which was replaced. Within twenty-four hours the rigidity of the neck had disappeared, blood pressure was 110, and the patient very much better. The drains were removed on the second day, and convalescence was uninterrupted. Cultures made from the fluid found in the dura were entirely negative.

Dr. William E. Leighton, of St. Louis[4] has done laminectomy in four cases of streptococcus meningitis with recovery in two of them.

It has been my privilege to operate on two cases of meningitis with one recovery and one death. Owing

to the rarety of successful operations in these conditions, I have deemed my two cases worthy of report.

Case 1.—My first patient was G. W. H. white. American widower, aged 40, a very powerfully built man in the prime of life.

On April 28, 1918, while watching a fire in Columbus, Georgia, a cartridge in the burning building exploded and the bullet struck him just above and to the inner side of the left eye. It ranged backward and inward and lodged in the cribriform plate of the ethmoid. He was not seriously incapacitated at the time and came to St. Louis and presented himself at my office for examination a few days after the injury.

There was an open wound in the upper and inner margin of the left orbit, and a radiographic examination showed that a bullet of thirty-eight caliber had lodged in the cribriform cells of the ethmoid.

On May 6, 1919, I operated to remove the bullet. The patient was given ether, and the wound was opened sufficiently to admit the little finger. Some bone spiculæ were removed, but the bullet could not be located until we removed the patient to the *x*-ray room and worked directly under the fluoroscope. The bullet was then extracted in probably not more than a minute. It was found that the orbital plate was broken, and a small piece of bone came away with a little brain tissue. The skin was closed with a running suture of catgut except at the point of insertion of the rubber dam drain. Convalescence was perfectly normal until May 14, when the patient got out of bed although strictly enjoined not to do so.

On May 15 spinal fluid started leaking from the wound. The temperature which had been normal, rose to 101°; pulse, 84; respiration, 22.

On May 17 the temperature became normal, and leakage stopped. The patient complained of a peculiar buzzing in the head.

On May 19 cerebrospinal fluid started to leak from the nose.

On May 21 the patient had chilly feelings with rise of temperature to 101°. There were the most intense headache and rigidity of the back of the neck, the head being absolutely fixed and thrown back. The meningitis was as marked as I had ever seen it. Kernig's sign was present. The pupils were small, and there was active delirium. The blood pressure was markedly increased.

Spinal puncture was done, and the fluid loaded with pus. The pus showed presence of diplococci and staphylococci. Cultures of pure staphylococci were obtained.

On May 22 laminectomy was performed under ether anesthesia. The spinous processes and laminæ of the third and fourth lumbar vertebræ were removed. The dura was exposed for about one inch with an area about one half inch wide. This was incised and a large amount of purulent fluid escaped. A section of the dura mater about one quarter inch wide was cut away, and a rubber dam drain inserted at the bottom of the wound.

The highest subsequent temperature was 102.8°; pulse, 96; respiration, 36. The patient was in a stupor and mentally incoherent for eight days.

On May 30 the rigidity of the neck had disappeared and the drain was removed.

On May 31 the temperature was normal for the first time. The headache had disappeared, but he was still somewhat irrational.

By June 6 all the mental symptoms had disappeared, and he was perfectly normal.

On June 7 he had a slight chill and a violent headache with a temperature of 101°. This, however, proved transient, and lasted but a few hours.

On June 20 he was allowed to sit up in the chair. From this time on his improvement was rapid, and he left the hospital the last of June. He kept gaining in weight and strength and resumed his regular duties as vice-president and active manager of one of our largest construction companies. He did not suffer any discomfort, pain or anything to indicate that he had been ill. The spinal incision was perfectly healed, and he does not seem to have any tendency to hernia. In November, 1919, without any warning he had what seemed to be an epileptic attack. This disappeared in a few minutes, and he had no further trouble. Up to the time of the epileptic attack he used alcohol quite freely, but since then he has absolutely abstained. On November 13, 1920, he reports being perfectly well.

Case 2.—The second case I wish to report is that of Mr. F. J., white, American, married, aged 27, an employe of the Wabash railway.

His case was referred from the service of one of our most efficient nose and throat men, Dr. M. F. Arbuckle. He came into Dr. Arbuckle's hands on September 27, 1919.

At that time he complained of pain in the left ear for several days. The first examination disclosed numerous hematomata on the drum. The drum was bulging, and there was extreme tenderness of the mastoid antrum. Great quantities of pus were coming from the nasal accessory sinuses. The drum was incised on October 9, and there was very free discharge of pus. The local symptoms in the ear and nose then improved very markedly. The tenderness of the bone also disappeared, but the patient had an intermittent fever that led to a special examination of the chest and abdomen. Nothing, however, was found. Gradual but slow improvement resulted, and at the end of two or three weeks the patient was able to come to the office. The discharge from the ear and mouth was still very copious and thick and yellow in character.

On October 23 mastoid tenderness and high fever developed, and Dr. Arbuckle was called to the house. He made a diagnosis of meningitis and sent the patient to the hospital on October 24. The temperature on admission was 99.2°; pulse, 86. There were tenderness over the mastoid and pain in the back and muscles of the leg. This was associated with marked headache and an elevation of temperature to 102°. The pulse increased to 118. The urinalysis was negative. Unfortunately, no blood count was made. On October 25 spinal puncture disclosed three ounces of spinal fluid under pressure.

There was an examination by the National Laboratory, which reported that the smear contained no organisms.

There was a high cell count of polymorphonuclears. Apparently cultures were not made.

On October 25 Dr. Arbuckle did a simple mastoid operation and pus was found present in the mastoid cells. Flexner serum was injected on October 27. Before giving this serum another spinal puncture was done. The fluid drawn from this was cloudy and the cultures made from it were negative.

On October 28 I was called in consultation. The patient was found suffering from a profound meningitis and in a state of moderate stupor, and only semiconscious. He had all the symptoms of meningitis. Temperature was 101.4°; pulse, 134.

After consultation we decided that laminectomy offered the best and only possible chance of recovery. Laminectomy was done in the region of the second and third lumbar vertebræ. On opening the dura we were surprised to see only two or three drops of rather turbid fluid escape.

An instrument with a blunt point was then inserted upward in the dural cavity. Some dense adhesions were encountered, and when these were penetrated we were astonished to see a gush of pure whitish pus that must have been as much as 20 cubic centimeters. Unfortunately, no culture tubes were available so the value of the examination of this fluid was lost. The fact, however, that we had to open through some adhesions before the pus escaped freely shows how readily pus may become walled off in the spinal canal. This would naturally lead to the inference that, if operation is to be done, it should be done early.

A rubber dam drain was inserted down to the dura and the wound closed. As this operation was done in a small hospital away from the city I did not get an opportunity to see the patient again. The temperature dropped down to less than 100°, and the drainage was very free. The patient, however, was restless and delirious and he died at 7:00 A. M. on the morning of the 30th, two days after operation.

I believe in cases of meningitis from streptococcus or staphylococcus, operation should be done. Whether or not it will be found advisable in those cases of meningitis following influenza seems an open question.

I have known a few of these cases to be operated on, but have never known one to be operated on early, nor have I known a recovery to follow laminectomy in any of them. Recovery has followed repeated spinal puncture, and it does seem only rational that laminectomy should yield infinitely better results than spinal puncture if done before the cerebrospinal channels are blocked by inflammatory products or adhesions.

REFERENCES

1. Seelig and Hagler: Interstate Med. Jou., Mar 1915.
2. Netter: Osler's Modern Medicine, ii, 248.
3. Barr: Brit. Med. Jou., Nov. 26, 1911.
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5. Leighton: Jour. Am. Med. Assn., lxiv, 2054-2056.

DISCUSSION

Dr. W. E. Leighton (St. Louis, Mo.): The operation was brought forward a good many years ago in the treatment of epidemic meningitis. It was strongly favored by a great many men, among them Cushing, although he later condemned the operation, along with the operation of cerebellar decompression combined with lumbar laminectomy and through irrigation

advocated by Leonard Hill. The late Dr. John B. Murphy described a similar procedure substituting opening of the sacral cisterna for the lumbar laminectomy and reported a recovery.

Beck, of Chicago, reported a case of pneumococcus meningitis which recovered with a similar operation and I believe this is the only case on record that has recovered.

Haynes and Kopetsky more recently favored cerebellar decompression with drainage of the cisterna magna but reported no cures in six cases and Day did not get a cure in nine cases. In spite of strong appeals for this operation it does not seem to fulfil the expectations of its advocates.

Following the report of Barth in 1914 of three recoveries in three cases of streptococcus meningitis by the operation of lumbar laminectomy with drainage I reported the recovery of two cases of streptococcus meningitis by a similar operation. Whereas Barth used a gauze tampon I employed a rubber dam drain which was inserted only to the incision in the dura. The free escape of spinal fluid did not appear to have any harmful action and in one case where the wound tended to close early, a high rise in temperature on three different occasions was reduced at once by opening the wound and allowing the spinal fluid to escape. I believe that early operation and prompt treatment offers something in these desperate cases and I found no cases of cure in streptococcus meningitis which was unoperated. I operated also on two cases of staphylococcus meningitis and one of pneumococcus meningitis, but these were unsuccessful.

Dr. Henry R. McGraw (Denver, Colo.): About three or four years ago we had a case of meningitis following an operation for deflected septum. Symptoms of meningitis developed three or four days after the septum operation. A lumbar puncture was done, and a very cloudy fluid secured, which was examined and found to contain much pus, and a pneumococcus was demonstrated. When I saw the child he was in a very desperate condition with temperature of 105°-6° and unconscious. I did a laminectomy and a subtentorial decompression and gently washed the cavities out with normal salt solution. After the operation the temperature dropped to normal, the child returned to consciousness, and we were very much encouraged with reference to the prognosis. Three or four days later the temperature began to rise, and the internes at the hospital attempted to irrigate the cavity with a pretty

high pressure, causing respiratory failure, and the child died on the table. It seems to me that a cavity full of pus, whether it be a bony cavity or a serous cavity, should be very thoroughly and properly drained. I am thoroughly convinced that if this procedure is carried out we might expect good results in many cases of acute meningitis.

Dr. Hill (closing): In my mind, if we are going to benefit a patient with meningitis by doing laminectomy, it must be done before adhesions have formed that tend to obstruct the elimination of inflammatory products. It will be noted that in all the successful cases, including the cases of Dr. Downes, Dr. Leighton, and myself, the operation was done soon after the onset of the meningitis. I think enough has been done to establish the value of this operation in cases due to the streptococcus and the staphylococcus, and I see no reason why it should not be successfully extended to acute forms of meningitis resulting from other organisms. In my judgment this operation will ultimately become recognized and standardized, just as much as the one for acute appendicitis.

SECTION OF THE ANTEROLATERAL TRACT OF THE CORD FOR THE RELIEF OF INTRACTABLE PAIN DUE TO SPINAL CORD LESIONS

W. E. Leighton, A. B., M. D., F. A. C. S.

ST. LOUIS, MISSOURI

The problem of relieving the pain arising from lesions involving the spinal cord or peripheral nervous system may try the resources of physicians and surgeons alike. The remedy for these distressing conditions is therapeutic or such radical procedures as section of the cord, complete or partial; division of the posterior spinal roots; division of the posterior columns of the cord; section of the pain conducting tracts in the cord above the level of the disease and extradural operations on spinal roots or ganglia.

What does medicine offer? Therapeutic measures, consisting chiefly of the administration of drugs of the opium group, usually prove unsatisfactory. The condition of the patient becomes pitiable. Deriving only temporary relief, he either becomes addicted to the use of morphine or despairing of relief may attempt suicide.

What does surgery offer? Thanks to the neurologist, several measures have been advocated. Although section of the cord has been suggested as a last resort in lesions producing unbearable pain, one can hardly conceive such a measure actually being carried out with all the outcome which a complete paralysis would bring. Division of the posterior roots of the spinal cord for the relief of pain was first suggested by Dana in 1888, and Abbe was the first to report the operation. Since this time numerous root resections are on record, and, although the operation would appear theoretically sound, many failures to attain the desired result have

been reported. In 1900 Mingazzini proposed the operation for gastric crises and lancinating pains of tabes; but it was not until 1908 that Foerster first reported the operation for this disease. The result of operation in a large series of these cases has not been entirely satisfactory. "In 1910 A. Schuller suggested that as a substitute operation partial division of the spinal cord might be employed instead of section of the posterior roots for spasticity, either alone or with the direct cerebellar tract; the anterolateral column might be cut for gastric crises. He reported no cases in which this operation was performed, and he advised it for these two conditions."

A notable contribution to this subject was made by Spiller in 1912. He proposed employing the method of dividing the anterolateral tract of the cord for the relief of persistent pain of organic origin independent of gastric crises, and with Martin published the result of the first case illustrating this procedure. The operation was performed by Martin January 19, 1911. Since then the operation has been performed by Beer, Foerster, Elsberg, and Frazier who recently published his results in six cases

A brief abstract of the recorded cases is here included.

Spiller and Martin. Jour. Am. Med. Assn., 1912, lviii, 1498. Patient had an inoperable tumor of the lower part of the spinal cord from which he suffered severe pain in both legs for two years previous to operation. At the suggestion of Spiller a division of each anterolateral tract was made by Martin January 19, 1911. The laminæ and spinous processes of the sixth, seventh and eighth thoracic vertebræ were removed. Two months later it was noted that the operation seemed to have been successful in diminishing the pain.

Beer. Jour. Am. Med. Assn., 1913, lx, 267. Metastatic carcinoma in the pelvis originating from the cervix uteri, which was removed fifteen months before. Severe pain in the right leg, which caused the patient to draw up the leg. A stovaine injection into the spinal canal was made with complete temporary relief of all pain. He advises this procedure on the ground that, if the injection

does not produce relief, the operation is contra-indicated for self-evident reasons. On July 2, 1912, a laminectomy with removal of the ninth and tenth thoracic laminæ was made, and the left anterolateral column was sectioned. Twelve days after the operation the patient was up walking about; all pain in the right lower extremity was gone, and no vestige of it was felt since operation. Some pain developed later in the left side and back but to the day of her death patient was free from pain in right side.

Foerster: Surgery of the Spinal Column by Frazier, p. 910. At Foerster's suggestion Tietze performed a section of the lateral column on a patient who had previously had a root resection for gastric crises in which posterior roots from the sixth to twelfth thoracic had been cut. Pains which became unbearable appeared in the left leg. An attempt to section the lumbar roots was found impossible because of adhesions, and section of the anterolateral columns was decided upon. Following this the pain entirely disappeared.

Elsberg: Diseases of the Spinal Cord and its Membranes by Elsberg, p. 164. Reference to, but no abstract of, the operation is given.

Frazier: Arch. Neurol. & Psych., iv, 137.

Case 1.—The patient had an inoperable sarcoma of the spine at the level of the second and third lumbar vertebræ Suffering was intense, and uncontrolled by morphine. Chordotomy was employed with section of the anterolateral column, right and left, at the level of the first lumbar segment. This resulted in total loss of thermal and pain sensation.

Case 2.—The patient had a gun-shot wound of the spine with intense pain in the left lower extremity. Four grains of morphine a day were given with only partial relief. Unilateral chordotomy was performed and resulted in complete cessation of pain. There had been no recurrence at the last observation, twelve months later.

Case 3.—The patient had carcinoma of the rectum, with pain in the rectum, buttock, and thighs. Colostomy and section of the anterolateral column, left and right, were performed. Complete loss of thermal and pain sense on one side only resulted. Radiumtherapy was employed for the carcinoma. Four years later the patient reported himself free from discomfort; presumptive recovery.

Case 4.—The patient had an inoperable sarcoma of the thigh with pelvic metastasis and insufferable pain in the

gluteal region. The anterolateral columns of the cord were sectioned with relief from pain from the time of the operation until the patient's death, months later.

Case 5.—The patient had received a gun shot wound of the spine, and suffered pain in both lower extremities. Chordotomy was performed with loss of pain and temperature sense.

Case 6.—The patient had received a shell wound of the pelvis with injury to the sciatic nerve. He had had intense unbearable pain in the thigh and foot for two and a half years, unrelieved and unabated. The anterolateral columns were sectioned with absolute relief. There was recurrence of pain much more moderate, several months later.

SELECTION OF THE SEGMENT OF CORD FOR OPERATION

In the language of Frazier. "the question of segmental selection is a matter of some concern. We assume that the lesion does not involve the upper extremity. Manifestly, the section could not be made sufficiently high, that is, several segments above the origin of the brachial plexus, with any degree of safety. We assume that the lesion is in the pelvis or involves the spinal column not above the lesion so as to ensure the crossing of all afferent tracts and to allow for the extension of the growth upward, it would be well to add two or three segments. So much for the physiological or anatomical grounds. From the practical or technical point of view, I have selected the sixth thoracic segment as the most convenient for all lesions not higher than the ninth or tenth segments." In his book on "Surgery of the Spinal Cord," Frazier suggests that the fourth, fifth, or sixth thoracic segment should be selected as this level would be appropriate not only for the relief of pain in the lower extremity but for the relief of gastric crises.

DESCRIPTION OF THE OPERATION

In this operation as in all surgical procedures a knowledge of the anatomy and physiology of the spinal cord is essential. The cord is exposed in the region of the fourth, fifth, or sixth thoracic segments by the

usual laminectomy. Removal of two laminæ is as a rule sufficient for the proper exposure of the cord. The dura having been opened the dentate ligament is identified, grasped with a mosquito forceps, and severed from the dura. Traction on this ligament will rotate the cord so that the anterolateral tract may be readily exposed. A small Von Graefe knife with its back toward the dentate ligament is inserted just in front of the ligament and passed to a depth of 2.5 millimeters and brought out behind the origin of the anterior roots, making an incision approximately 2.5 millimeters deep by 3 millimeters wide. The section may be unilateral or bilateral depending on the nature of the lesions. Bleeding is usually slight following the section. A stovaine block may be employed previous to the section by placing a pledget of cotton saturated with 0.4 stovaine solution on the cord above the level of the section. Following the section the dura is closed and the laminectomy wound sutured in layers .

POSTOPERATIVE TREATMENT

Following the operation careful nursing must be carried out as the patient has lost both pain and temperature sense if the operation has been correctly done, and the patient must also be warned of this particular. In all of my cases a hyperesthetic zone at the level of the divided segment has been noticed. Pain at this level may be so severe as to require an opiate to relieve it.

The phenomena of bowel distention, constipation, bladder tenesmus with retention, symptoms not unusual in laminectomies, were present in all my cases. These symptoms, however, disappeared within a short time.

Only a brief summary of my operations is here given as a more extensive neurological report will be made later.

Case 1.—Referred by Dr. Romeiser of the Neurological Service, St. Louis City Hospital. W. J., aged 34, a poorly developed and nourished man, had suffered from tabes for past six years. He has all the classical signs of tabes:

Argyll Robertson pupils, absent knee-jerk, muscular incoordination, trophic ulcers, etc. His blood and spinal fluid gave a positive Wassermann. He had pain in the right side of the trunk involving leg. The pain has been so severe that the patient has attempted suicide four different times. He has become addicted to the use of morphine. The patient was seen in consultation with Dr. Romeiser, who had advised a root resection, but on account of the extensive root resection necessary it was decided to divide the anterolateral column.

Operation, August 24, 1920—Through a laminectomy of the fifth, sixth and seventh laminæ the cord was exposed. Because the right side of the body alone was involved only a unilateral section of the anterior column was attempted. The operation was performed as outlined above.

Postoperative Notes.—A painful hyperesthetic area appeared below the costal margin, probably due to the irritation of the cord at the corresponding segment, which required morphine for several days. There was some bladder tenesmus, retention, and incontinence of urine at times. Diarrhea persisted for three weeks. Pain disappeared from the right leg immediately following operation. He occasionally complained of pain on the left side of body. I believe a bilateral section should have been done.

Case 2.—Referred By Dr. Romeiser. P. B., a poorly nourished white male, aged 32, received an injury to his spine in a railroad accident eight years ago. Immediately following his injury a laminectomy was done at the level of the ninth, tenth, and eleventh thoracic vertebræ, and a spicula of bone was removed from the cord. Two years later Dr. Chaddock advised a section of the posterior roots which was attempted, but owing to the trauma, incident to the previous operation or injury, the nerve roots could not be identified and nothing was done. There is present incomplete paralysis of both legs with atrophy of muscles. The patient complained of severe pain in the abdomen and lancinating pains in both legs. He requires morphine constantly. On advice of Dr. Romeiser a laminectomy was carried out September 8, 1920, by removing fifth, sixth, and seventh laminæ and a bilateral section of the anterolateral columns was made at level of sixth thoracic segment.

Postoperative Notes.—Pains in both legs have disappeared. For two weeks there were uncontrollable vomiting and during the second week some diarrhea lasting

two weeks. Tenesmus was present in bowels and bladder A hyperesthetic zone can be demonstrated at the tenth and eleventh segments. Pain and temperature sensation are absolutely abolished in both legs below the level of the twelfth thoracic segment. There has been decided improvement in this patient. No opiate is required and he is much benefited by the operation.

Case 3.—Referred by Dr. Unterberg. Mrs. W. has been a sufferer from tabes for twenty years with more or less pain during this time. For the past two years she has not been free from pain a single day. She has been under the care of several neurologists. She has all the classical symptoms and signs of tabes with gastric crises and lancinating pains in both legs. On September 11, 1920, the fifth and sixth thoracic laminæ were removed by the usual laminectomy, and the cord exposed. The presence of an old leptomeningitis was revealed which rendered the exposure of the lateral columns difficult. With careful search a point was selected and division of the antero-lateral column made.

Postoperative Notes.—On arousing from the anesthesia she said her legs felt like a new-born baby's. She was entirely unconsious of them except for her inability to move them. Loss of pain sensation was complete in both legs. The same hyperesthetic area below the costal margin appeared, which required an opiate to relieve it. Bladder and bowel distention were marked and tenesmus of the bladder was very annoying. She was up and about in two weeks and did her own housework. She recently had a painful spot appear below the right scapula. The result from this operation was most satisfactory for relief of pain in body and legs. On account of the plastic meningitis found it would have been better if section of the posterior roots in the field of operation had been made.

Case 4.—Referred by Dr. Unterberg of the Alexian Brothers Hospital, and operated on through the courtesy of Dr. Carrol Smith. M. D., aged 46, a paper-hanger has been a sufferer from tabetic crises for the past ten or twelve years. He is blind in left eye, he had staggering gait during past six months. He had shooting pains in both legs for years. On October 22, 1920, a section of the anterolateral column was done, through a laminectomy at the level of the fifth, sixth, and seventh laminæ, preceded by a 0.5 per cent stovaine block.

Postoperative Notes.—There was very little disturbance following the operation. The patient was free from pain for several days and did not require any opiate. Says

that he has occasional pain in feet. The neurological report has not been returned. Patient left hospital November 18, 1920. The patient's condition seemed much improved. All of the spinothalamic fibers apparently were not divided in this case.

CONCLUSIONS

From my experience in four cases I believe it has been shown that the operation will produce a permanent relief in any lesion below the thoracic level. In the case of gastric crises I believe that the section will have to be made higher than the sixth thoracic segment, and I see no reason why it should not be made as high as the second or third thoracic. I would also add to the operation section of the posterior nerve roots which are present in the field, as this would destroy sensory impulses which reach to a higher level and are not touched in the section of the anterolateral columns since this section includes only pain impulses which have crossed to the spinothalamic tract below this level. The researches of Head and Pilz would seem to show that pain and temperature fibres require four to six segments for their complete crossing in the cord. If this is so, the section of the several nerve roots which present in the field would seem to enhance the value of the operation especially in the tabetic case with pain involving the trunk. The removal of four laminæ, instead of two, and the removal of four posterior roots would bridge the gap not included by the section of the anterolateral columns. I believe that a bilateral operation should be done in all tabetics, in operable tumor of the cord or such cases as reported by Beer of metastatic pelvic tumors.

The advice of Spiller, that the incision of the cord might be carried forward even including the anterior horn or motor root in the thoracic region, would appear to be a good one, as little harm could be produced by it. The greatest danger is in cutting too far posteriorly and thereby injuring the pyramidal tract.

The operation while a delicate one is not difficult to perform, if one will familiarize himself with the subject. It should not be employed recklessly, but only after due consideration and in consultation with the neurologist.

FOR DISCUSSION SEE PAGE 279

SECTION OF THE SENSORY ROOT OF THE FIFTH CRANIAL NERVE UNDER LOCAL ANESTHESIA

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The history of the surgery of the fifth cranial nerve makes most interesting reading to the surgeon and he thrills with satisfaction as gradually but surely he follows the path beset with difficulty and danger along which have traveled his predecessors in their successful warfare against one of the most mercilessly painful and formerly incurable scourges to which human flesh is heir—true trigeminal neuralgia major—tic-douloureux.

It is said that Albinus and Galen suggested nerve division for neuralgia and Mareschal, surgeon to Louis XIV, is said to have done this operation, but the facial was the nerve sectioned. It is said by Rose that the first record of its performance is by Schlichting, in 1748, while removal of a portion of the ulnar nerve for neuralgia—neurectomy—was done by Abernethy in 1793.

However, it was early seen that simple division of nerve branch or resection of a portion of the same was of no lasting benefit and various plans were devised to prolong the period of cure. Klein, in 1822, is said to have crushed and cauterized the divided central end, and Malgaigne split the divided ends and folded them back on themselves in a loop. All methods, however, seemed to fail to effect permanent cure, and it is said that when Delpech declared, in 1832 that nothing could prevent the ends from uniting, the operations for neuralgia fell into disuse.

The struggle was resumed in 1852 by Roux and Sedillot. Braun is said to have suggested that the

sections were not long enough, and soon Thiersch was removing by dissection and avulsion even long stems and branches.

It was early observed that the closer to the brain the nerve was severed, the longer the freedom from recurrence, and Malgaigne cut the infra-orbital before it entered the canal and then drew it out.

Nerve stretching had been found useful in the treat-

Fig. 1.—The skin of the line of the incision and beyond its end is infiltrated, the loose layer thereunder is flooded, then the temporal fascia and periosteum are injected. All of the tissues, a finger's breadth on each side of it above the zygoma for a distance of two inches, are similarly infiltrated.

ment of sciatica and was tried on the fifth by Walsham and later by Vogt and Billroth. Like almost every new method it was given a trial for neuralgia but soon thrown aside.

Even cutting and stretching of the facial was in favor for a time. At first it was done on the assumption that the seventh was the sensory nerve of the face, and it was performed even after this was known to be untrue and was advised and practiced even by John Bell. It was practiced as late as 1893 by Schulze and Berger. It is interesting to note here that there is a neuralgia of the head and face for which this has been practiced by Cushing but not for major trigeminal neuralgia.

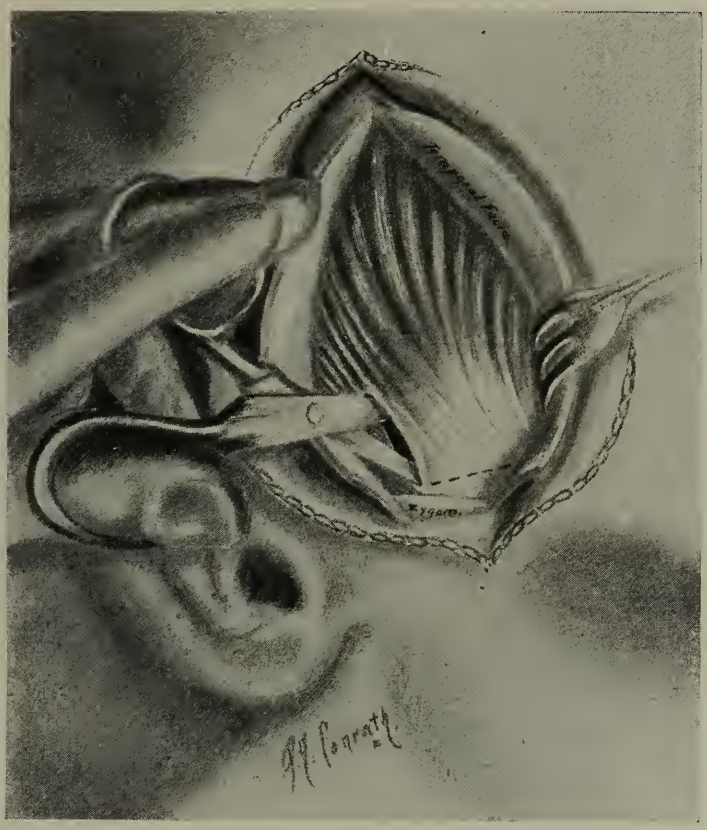

Fig. 2.—The fibers of the temporal muscle are separated. If retraction is very difficult the tendon may be cut along the dotted line shown. The muscle will not likely be of much value to the individual once this operation has been performed as most likely the motor root is destroyed along with the sensory

Operations for the dread disease were not confined alone to the nerves of the face. Nussbaum and Trousseau are said to have advocated ligation of the common carotid, and Patruban did so. The treatment never

became widespread or popular, although cures were reported.

In 1858 Carnochan became convinced that Meckel's ganglion was the offender in major neuralgia, partticularly when that part of the face supplied by the middle division was the seat of the pain. He accordingly made war upon it and excised the nerve beyond

Fig. 3.—The bone is drilled with a burr and the opening enlarged downward to the base and a little farther. The opening is not quite so large as a half dollar, somewhat horseshoe shaped, convex up.

the ganglion and removed the ganglion also; again success seemed to have been achieved. Coming down to recent years we have Sluder's description of a peculiar form of facial neuralgia which seems to be relieved and often cured by treatment directed to Meckel's ganglion.

Carnochan, following the tract of Roux, advanced from in front through the mouth and later the face across the antrum and into the sphenopalatine fossa; Luecke, from the side chiseled through zygoma, malar, maxilla, and pterygoid to reach the same objective; and Pancoast arrived at the foramen ovale by passing under the zygoma and cutting off the coronoid; while Crede and Kroenlein, in addition, turned the zygoma up out of the way.

Fig. 4.—Shows relation of middle meningeal and third division. The outline of the ganglion in its dural sheath is seen.

Claude Bernard credits Charles Bell with having discovered the respective functions of the fifth and seventh cranial nerves and with having suggested the functions of the anterior and posterior roots of the spinal nerves. He also asserts that Majendie proved that the posterior spinal roots were purely sensory, and he furthermore states that Majendie observed the fact that section of the root of the fifth proximal to the ganglion was not followed by ocular disease as

was section of branches of the fifth distal to the ganglion. Waller discovered the phenomenon of degeneration and confirmed the findings of Bernard.

In 1888 Abbe divided spinal roots for brachial neuralgia; the same was done by Bennett and Horsley a short time later.

Before this, however, the removal of the ganglion of the fifth as a cure for neuralgia had been suggested by

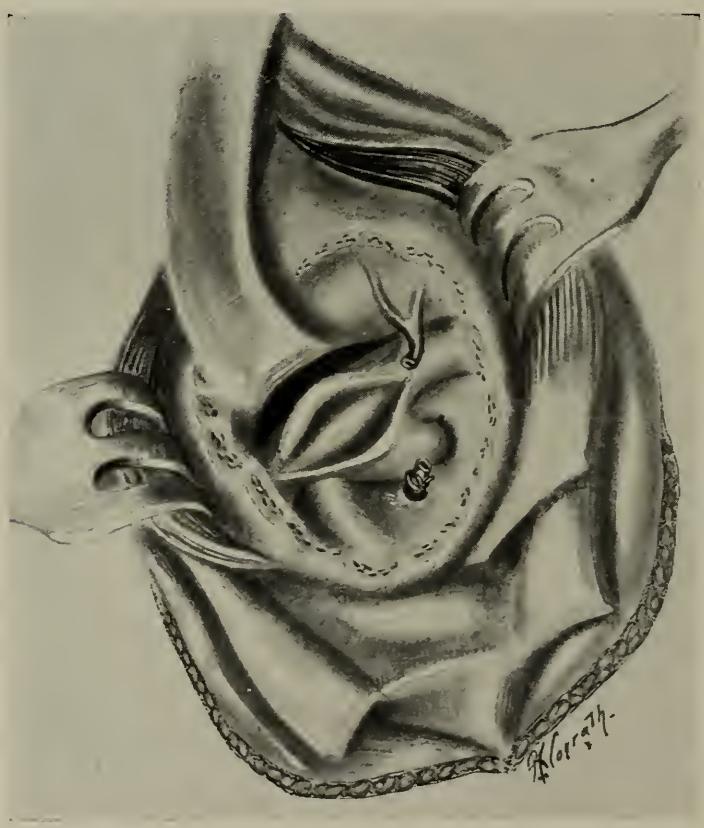

Fig. 5.—The dural sheath covering the ganglion on its superior, external surface has been divided and separated from the ganglion.

Mears, of Philadelphia, in 1884. Horsley, at work in his laboratory about this time and later, was trying on the lower animals the feasibility of removal of the ganglion and of division of its sensory root; and, in 1890, William Rose, a pupil of Horsley, got an opportunity to attempt removal of the ganglion in a patient. He removed the upper jaw and drilled through the base of the skull at the foramen ovale and succeeded in

removing that part of the ganglion from which spring the second and third divisions.

Horsley himself, in 1891, approaching from the side, opened the skull, divided the dura, lifted up the temporal lobe, and, grasping the sensory root behind the ganglion, avulsed it from the pons. The patient died without regaining consciousness; and, although Horsley had done the operation successfully on the lower animals, he did not seem to be favorably impressed by his result on the human.

Fig. 6.—A small blunt curved probe is made to pass around the root and the root is cut or avulsed as pleases the operator.

Some time before thisWagner had devised the osteoplastic flap method of opening the skull, and, in 1891, Frank Hartley, of New York, approached the ganglion from the side and removed it after laying down a large osteoplastic flap and reaching the ganglion by the extradural route. His case was successful. Krause six months later (after Hartley had shown his case and described his method before the New York Surgical Society), described the very same procedure. He

excised the second and third divisions from just within their foramina to just beyond the ganglion, elevating the dura to do so just as Hartley had done..

In addition to this Krause also removed by avulsion the sensory root in one case.

Doyen, finding that this method subjected the brain to too much trauma and pressure, turned down the zygoma, cut the coronoid, and turned it and the temporal muscle up, then removed the lower part of the squama and the wing of the sphenoid. He then gnawed away the base until the foramen ovale was reached.

Tiffany, of Baltimore, declared against a bone flap not because of added trauma or time but because its absence left easy route of access in case of future necessity. One suggestion of his I have found of very great use in this operation, that is to separate the dura from the base by means of a piece of absorbent cotton grasped in a forceps.

Cushing and American surgeons now use the low opening, but the base is not gnawed away.

Frazier, in 1903, at the suggestion of Spiller began to cut the sensory root in preference to removal of the ganglion. In 1900, Cushing declared against such a procedure because it was not certain from experimental research that regeneration could not occur. Frazier's cures, however, were apparently just as permanent and the differences in the operations are so striking with regard to danger and difficulty that at present root section or avulsion seems to be the favorite operation in the United States.

As Frazier himself says, "When one has reached the ganglion the difficulties of ganglionectomy are just commencing, but in his operation (root section) when the ganglion is reached the operation is practically over." I agree with him after trying both.

In cases operated upon under general anesthesia I had trouble with the bleeding and also in trying to

maintain the head in proper position. Mechanical contrivances once getting out of place were very hard to readjust without danger of contamination, and, furthermore, the danger of movement was not always obviated even with a very expert anesthetist.

It is my custom to use local anesthesia wherever possible; and almost all operations about the head and face are done under it as a routine procedure. Therefore, last summer, I decided to try it in operating for neuralgia after having noted the ease with which Adson reached the ganglion through what amounts to a linear incision.

Abbe, in 1900, in approaching the foramina ovale et rotundum for neurectomy by Salzer's method, advocated splitting the temporal muscle instead of dividing it. If the fibers of the muscle can be separated widely enough to give access a similar incision in the skin can be stretched wide enough. I saw Adson, of Rochester, Minnesota, approach the ganglion through practically an oblique linear incision, a very slight horizontal cut only being made at its lower end. If such an oblique linear incision be extended downward through the skin to a point one-half inch below the zygoma and the temporal fascia freed from its attachment to the zygoma, it is all sufficient.

All of the line of incision and beyond its end must be infiltrated, then the loose layer thereunder is flooded; next the temporal fascia (this is very sensitive like the deep fascia elsewhere), must be similarly treated and not only in the line of incision but a finger's breadth on each side of it above the zygoma for a distance of two inches.

Then the temporal muscle and periosteum are similarly injected. The solution used is procaine one-half per cent with six or seven drops of epinephrin to each ounce. The incision is made through the scalp and the vessels caught and tied. The flaps are dissected back, the underlying fascia is divided in the line of the skin incision and also separated from its

attachment to the upper border of the zygoma. The muscle is split and the skull exposed. The periosteum is scraped off from the lower part of the squama and wing of sphenoid to the base, all vessels are caught and tied and good retraction exposure made.

The bone is drilled with a burr and the opening enlarged downward to the base and a little farther. The opening need not be quite so large as a half dollar and is somewhat horseshoe shaped, convex up.

The dura is slightly sensitive, but, if the pledgets used in separating it are soaked in the procaine solution, the process is painless and less bloody. One proceeds very slowly and carefully, and soon the middle meningeal is found coming up through its foramen. Just before reaching it I encountered once the elevated ridge referred to long ago by Cushing, which had to be chisseled off. The tying of vessels generally causes some pain, and I, therefore, make sure of good anesthesia around the artery by injecting again into the tissue close to it before I begin to expose it. The vessel is tied with fine strong silk, black preferred, and the vessel is cut as it enters the dura. I have never used two ligatures.

The third division of the fifth nerve is now seen, but it is generally seen while trying to get the artery ready for tying. Here, again, is a sensitive spot and it is now well to inject a few drops more of the solution around and into the sheath of the nerve. A little more elevation of the dura in front of it and one sees the second division. The dura is now elevated a little behind the third division, and soon one finds the notch in the upper border of the petrous bone over which comes the sensory root into the cave of Meckel The root, of course, is not visible as here it is inside the dura. The sheath of dura covering the ganglion is now cut at a point midway between the second and third divisions, and a small curved blunt seeker like that devised by Staacke for mastoid work is introduced and worked between the ganglion and its sheath toward the apex of the petrous bone until it goes through the

foramen in the dura through which the root leaves the posterior fossa.

This is the most delicate part of the operation. If it is painful more procaine is injected into the sheath of the ganglion, but usually enough will have been injected into the sheath of the third division to have caused anesthesia of the entire ganglion sheath.

It is well to incise the dura over the seeker a little at a time as this makes it easier to advance the line of separation of sheath from ganglion. When the end of the seeker enters the foramen in the dura through which the root enters the cave of Meckel there is pain and on withdrawing it spinal fluid flows.

When the dura has been incised along this track it is separated from the upper outer surface of the ganglion until the foramen in the dura leading to the posterior fossa is reached and the root can be seen coming through

The inner aspect of the dura is very sensitive and a pledget of cotton soaked in a solution of cocaine, 2 per cent, is laid over the root for a minute.

A small curved blunt probe is now made to pass around the root and the root may be avulsed or cut as the operator pleases I believe avulsion is easier and just as certain and safe

The advantages of local anesthesia over general have been so often rehearsed that to repeat them is tiresome. Of course, some persons will insist on being "put sound asleep before any cut is made" and others are "too nervous" for local anesthesia for even trivial operations.

This operation is best done with the patient sitting up —I use an ordinary dental chair which can be raised or lowered or put in horizontal position if need be. If a patient is under a general anesthetic this is a hard position to maintain.

I know that many surgeons are opposed to local anesthesia because of inability to secure anesthesia.

I know that it is more difficult to produce analgesia with a local than with a general anesthetic. I know, too, that in the eyes of the patient the operation seems less serious if performed under local anesthesia and perhaps the patient, too, may think that the surgeon is more skillful if he insist on a general anesthetic.

I have been accused of making this a minor operation —I know that ganglionectomy is one of the most serious operations that a man can be called upon to do. No less a surgeon than W. W. Keen has owned that it was an operation which he approached without enthusiasm. I can say the same of it under general anesthesia. I have never done ganglionectomy under local. But I have done root resection under both, and there is no operation that I have ever done in which I have been better pleased by changing from the use of general to that of local anesthesia.

The surgeon who uses local anesthesia only occasionally should no more try to do this operation under local anesthesia than the surgeon who operates only occasionally should attempt to do, say, ganglionectomy.

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DISCUSSION ON THE TWO PRECEDING PAPERS

Dr. William T. Coughlin (St. Louis,, Mo.): It is quite wonderful to see the change that has come over the two patients of Dr. Leighton. Surely, with the success he has had, he is going to try the operation on many others, and come into his own. It opens up a great field for relief of pain, so often seen in carcinoma.

Dr. Leighton (closing) I have nothing further to add to my paper but would like to say a word about Dr. Coughlin's operation. I had the pleasure of seeing the result in two of his cases and I witnessed the operation in another and can heartily endorse everything which he has said as to the advantages of the operation under local anesthesia. This patient was absolutely at ease and uncomplaining throughout the operation; in fact she slept and snored most of the time. So I feel that this was an indication that the operation was done in perfect comfort to the patient.

SPLENECTOMY IN THE THIRD STAGE OF BANTI'S DISEASE

With Report of Case of Fifteen Months' Standing

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MINNEAPOLIS, MINNESOTA

Although much has been written on the subject of splenic anemia in general and many cases have been submitted to splenectomy with brilliant results, yet, after a fairly diligent search of the literature of the past twenty years, I find that comparatively few cases in the terminal stage, the so called Banti's stage, have been so treated. Even including cases with the most meager history and with practically no details, I have been able to collect only forty-two cases. Therefore, every single case of this type, if treated by removal of the spleen, assumes importance in helping to formulate a proper treatment, and for this reason I present the present report and analysis.

Because of the difficulty, or rather impossibility, of separating true cases of Banti's syndrome, that is, cases showing enlarged spleen, cirrhosis of the liver with ascites, and an unknown etiology from other conditions giving similar symptoms, I have included in this analysis all cases presenting ascites as a complication of enlarged spleen. Thus are included in the 42 cases analyzed, 7 of primary cirrhosis of the liver with ascites, 3 of syphilis with cirrhosis of the liver and ascites, 1 of thrombosis of the splenic and portal veins, with enlarged spleen and ascites (the diagnosis being made only at autopsy) and one of primary lymphosarcoma of the spleen with ascites. Patients presenting themselves with this syndrome are always questionable surgical risks, and it requires considerable moral courage and much surgical enthusiasm to offer so serious a procedure as splenectomy as a method of

treatment with so few recorded cases as justification. It has been my purpose, therefore, to try to determine, first, what has been the immediate mortality, and, second, what the permanency of results following splenectomy.

Many of the reports are so meager as to be of little value, some of them merely being mentioned casually as having been done with good results, with no reference as to when and where reported in detail, if ever so reported. In others the report has followed the operation so closely that deductions as to permanency of results are impossible, and apparently no subsequent reports have been made, at least I have been able to find such in only a few cases. If we are to arrive at any definite conclusion as to the value of splenectomy in these terminal conditions, it is essential that every case should be reported in detail, with a follow up report late enough to show ultimate results.

Concerning immediate mortality: Prior to 1908 there were 11 cases reported with a mortality of 72.7 per cent; between 1908 and 1913 there were 16 cases reported with a mortality of 56 per cent; and in the forty-two cases here reported, with 11 deaths, the mortality was still further reduced to 26.5 per cent. Thus it is seen that a patient has three out of four chances of surviving the operation. In view of the fact that this condition is 100 per cent fatal under medical treatment, this showing is remarkably good. As regards late results: In 5 cases there were no data at all, and these, therefore, are not considered. Of the rest, 1 was a failure from the start, requiring paracentesis twice a week, but was still alive 8 months after operation; 1 suffered repeated hemorrhages from the bowels and succumbed at the end of five months; 1 was apparently in perfect health at the end of a year, but suddenly died two months later from a hemorrhage from the stomach; 6 were alive and well at last report, from a few months up to fourteen months after operation; and 17 were alive and well for periods varying from fifteen months up to ten years after

operation. Thus it is seen that at least 55 per cent of the cases which survived operation lived and remained in good health for more than fifteen months; and may therefore be assumed to be permanently cured.

The case of lymphosarcoma was reported in perfect health after three years. One other case of sarcoma of the spleen was reported in 1908 as having lived for six years and a half, then dying of a cardiac affection.

The 3 cases with a definite syphilitic etiology all recovered, and 1 was in perfect health at the end of seventeen months.

BLOOD FINDINGS.

DATES	5/5/17	5/27/17	6/11/17	7/2/17	8/16/17	8/22/17	8/30/17	7/2	7/8	7/13	7/17	10/6	10/23	11/11	11/17	11/28/18	1/22/19	11/13/19
Hæmoglobin	55	40	35	40	60	50	55	55	45	50	50	45	45	42	55	65	70	85
Color Index	1.01	.9	1.07	.77	.8	.66	.63	.6	.6	.6	.6	.7	.7	.58	.72	.85	.80	.85
R.B.C.	2.72 Mil.	2.04 Mil.	1.64 Mil.	2.60 Mil.	3.70 Mil.	3.80 Mil.	4.40 Mil.	4.50 Mil.	4.07 Mil.	4.00 Mil.	4.00 Mil.	3.20 Mil.	3.30 Mil.	3.60 Mil.	3.80 Mil.	3.80 Mil.	4.40 Mil.	4.98 Mil.
Anisocytosis	0	0	-	-	Mkd.	Mod.	-	Mod.	Mod.	Mkd.	Mkd.	Mkd.	Mkd.	-	-	Slt.	-	0
Poikilocytosis	0	0	-	-	Slt.	Mod.	-	Slt.	Mod.	Mod.	Slt.	Mod.	Mod.	-	-	Neg.	-	0
Polychromato-	-	-	-	-	Slt.	Slt.	-	Mod.	Mod.	Slt.	Mod.	Slt.	Mod.	-	-	Neg.	-	0
W.B.C.	5000	5,100	5000	3400	4600	-	-	26,800	20,100	16,400	16,000	12,000	9,000	10,400	7,000	9000	10,000	8,650
Neutrophiles	69	70	-	-	56	-	-	89	90	74	75	79	70	63	-	70	70	44
Lymphos.	23	22	-	-	42	-	-	6	6	10	15	17	22	23	-	24	20	50
Large Mononuc	5	6	-	-	1	-	-	1	2	2	4	1	2	5	-	1	-	3
Transitionals	0	0	-	-	1	-	-	1	1	5	4	-	4	5	-	3	-	2
Eosinophiles	2	1	-	-	-	-	-	1	1	5	2	3	2	3	-	2	-	1

Fig. 1. Blood findings before and after splenectomy.

There were 7 cases reported as primary portal cirrhosis of the liver, with two operative deaths. One, reported by Sherren, besides ascites, had also marked edema of the legs and scrotum and fluid in the right pleural cavity, and it is not to be wondered at that death resulted. The other six are from the Mayo Clinic and are not reported in detail as far as I can find. One died, but the other five were reported as "greatly relieved" for periods not recorded. I could find no other cases of cirrhosis so treated. This group surely gives food for speculation as to the future possibilties of splenectomy as a successful treatment of

cirrhosis of the liver in its terminal fatal stage of ascites. As long ago as 1914, Kidd, commenting on the clinical similarity of Banti's disease with primary cirrhosis of the liver, made the assertion that all cases of hepatic cirrhosis with enlarged spleen should be given the benefit of a splenectomy, stating that "we now operate on cases labelled Banti's diseases, and it is hard to see where the difference lies." W. J. Mayo, having splenectomized 6 cases, with great benefit in 5 and death in only 1, makes practically the same

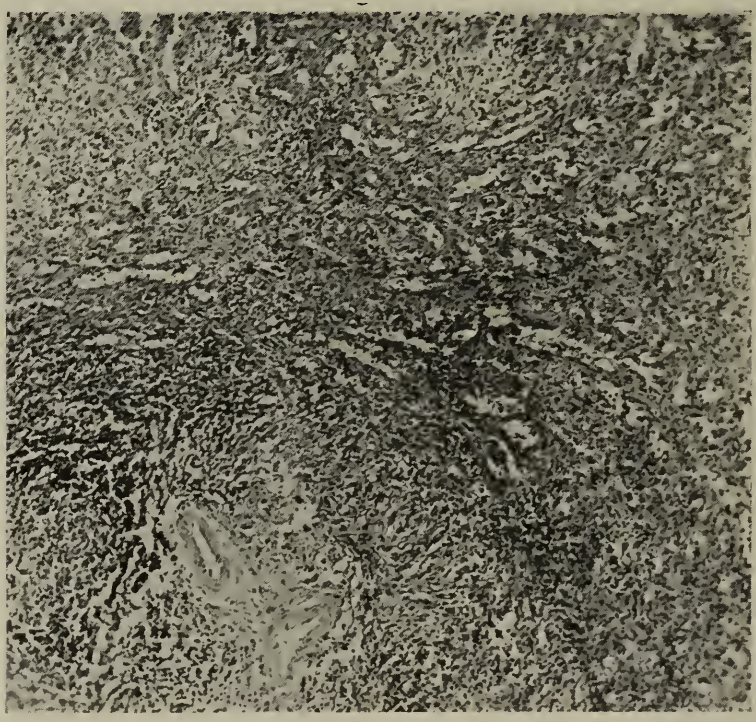

Fig. 2. Photomicrograph of section of spleen, low power note marked fibrosis of splenic pulp.

plea, saying that the results will depend on whether the liver retains sufficient capable cells to carry on its function.

I have found it impossible, on account of insufficient data in both the clinical and pathological histories, to differentiate the cases of undoubted Banti's disease from the others, and have therefore given up the attempt to analyze them separately. My own case, I think, can be classified without question as an undoubted case of third-stage Banti's disease, notwith-

standing the apparently brief first stage and the lack of clinical verification of an enlarged spleen preceding the cirrhosis and acites. It is certainly not a primary cirrhosis of the liver, and the possibility of its being syphilitic must be ruled out by the absence of all syphilitic signs, including a negative Wassermann.

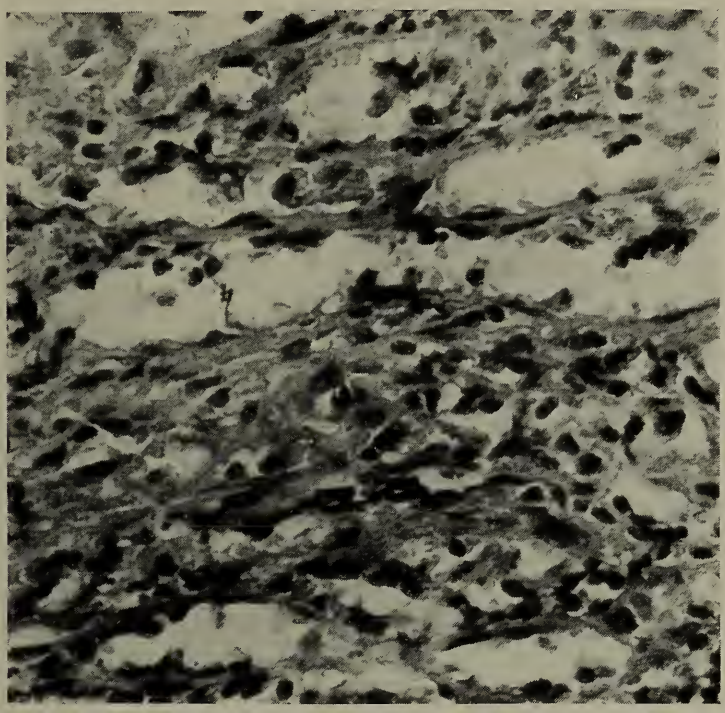

Fig. 3. Photomicrograph of section of spleen, high power. Same section as in Fig. 2. Note great increase in number of reticulum cells.

CASE-REPORT

The patient, Mr. A. M., entered St. Mary's Hospital, August 11, 1919, under the care of Lieut. David R. Higbee, Naval medical officer. He is thirty-seven years old, white, of Danish parentage, married three years, and has no children. He has been quartermaster in the U. S. Navy for nineteen years, and during that time has been in all parts of the world, in the tropics many times.

The family history has no bearing on his disease. His father and mother are living and are well at sixty and sixty-five years of age respectively. Two brothers and one sister are living and well, and two died in infancy.

In childhood patient had measles, mumps, and diphtheria, and tonsillectomy in 1901. In the same year his appendix

was removed, followed by five operations for the repair of the resultant hernia. In 1904 he suffered from pleurisy, but no aspiration was done. Although in the tropics many times he had never had any of the tropical diseases. Four years ago he had an attack diagnosed as malaria, and has had several similar attacks since. He denies any venereal infection, and has no alcohol habit.

Present illness—Until his present illness patient had always considered himself an exceptionally healthy man. In January, 1919 his wife and friends noticed an increasing pallor and a yellow tinge to the skin, of which he himself was unconscious, and they persuaded him to consult a physician. He was given iron and arsenic, but no examination of the blood was made until May 11, 1919, when his hemoglobin was found to be 60 per cent. During May he passed many bloody stools, the first very profuse, and on May 23, and 24 he vomited about two quarts of blood. On June 29 he again vomited blood in less amount, but since then there has been no hemorrhage either from bowel or stomach. On June 11 the ascites was first noted. During this time he was in a hospital in another city, and a diagnosis was made of either pernicious anemia or cirrhosis of the liver, and a very gloomy prognosis given. There was no edema. On July 7 his abdomen was tapped, the trocar-fistula remaining open for twelve days, during which time the drainage was very free. Nine days after the fistula closed, that is, on July 28, he was again tapped. During this time he was given repeated doses of horse serum, elaterium, and cacodylate of sodium. No observation had been made of an enlarged spleen.

On admission to St. Mary's Hospital, Minneapolis, on August 11, 1919, the following record was made: Male, 37, fairly well nourished, active, very alert mentally. Slight tremor. Weight 120 pounds, a loss of 15 pounds in three months. Mucous surfaces pale, skin a lemon color, and scleræ quite yellow. Appetite good, no vomiting, bowels regular, no cough, and only slight dyspnea. The abdomen was very much distended. The spleen, only palpable after tapping, extended to the level of the navel and to the mid-line. The liver was not palpable below the costal arch, in fact its area of dullness was diminished. The temperature varied between 98° and 99.5°; the pulse rate between 90 and 120; respiration 20 per minute. There were several formed bowel movements daily, dark-colored, and faintly positive to the benzidine test, but no active hemorrhage. The urine was clear, acid; specific gravity 1025; faint trace of albumin; no casts; no bile pigments, but on one occasion faintly positive for urobilin. There were no evidences of syphilis, and the Wassermann was

negative. August 12, examination of the blood showed the following: hemoglobin, 60 per cent; index, 0.8; erythrocytes, 3,700,000; leucocytes, 6,400; differential, polymorphonuclears 56 per cent; small lymphocytes, 42 per cent; mononuclears, 1 per cent; transitionals, 1 per cent; eosinophils, not noted; marked anisocytosis; slight poikilocytosis; no nucleated reds or myelocytes.

On August 21, paracentesis removed 6,000 cubic centimeters of clear straw-colored fluid from the abdominal cavity. On August 26 Dr. Higbee transfused 500 cubic centimeters of citrated blood without benefit; the blood examination three days later showing 4,000,000 erythrocytes and hemoglobin only 54 per cent. On August 31 he was again tapped and again about 6,000 cubic centimeters of fluid were recovered. From the clinical data and blood findings Dr. Higbee had made a diagnosis of splenomegaly in the terminal stage, which was concurred in by his consultants, and had urged operation as giving him his only chance.

On September 1, 1919, I removed the spleen, Drs. D. R. Higbee and Robert Hodapp acting as assistants. Although six liters of fluid had been removed the day before, reaccumulation had been so rapid that about the same amount was found at the time of the operation. The spleen was strongly adherent to the parietal peritoneum. A supernumerary spleen, the size of an English walnut, was attached to the tail of the pancreas. In removing this a fair-sized vessel was torn, to secure which it was necessary to pass a suture through the pancreatic tissue. The gall-bladder was normal and contained no stones. The liver was small and hard, and its surface hob-nailed, some of the elevations being as large as split peas.

The spleen measured 23 by 13 by 6.5 centimeters and weighed 850 grams, about four and a half times the normal size. The capsule and trabeculæ were thickened. The malpighian bodies were more or less atrophied and surrounded by a thick layer of fibrous tissue. The pulp was largely replaced by fibrous tissue, (Figs. 1 and 2)

Postoperative History.—Following the operation the temperature for four days remained as before, between 98.5° and 99.5°, but then increased to 102° F. and continued between 100° and 102° in the evening, with a daily drop to near normal in the morning. The pulse rate, except immediately after the operation, was only slightly increased, varying between 80 and 120. The ascites recurred rather slowly, but on the twenty-second day after

the operation paracentesis had to be resorted to, 6,100 grams being recovered. There was no further ascites, although no attempt had been made to sidetrack the blood stream around the liver by omentopexy.

The change in the blood-picture was prompt and quite striking as regards the leucocytes. On the day following the operation they increased from 4,600 to 27,800, of which 89 per cent were polymorphonuclears and 6 per cent small lymphocytes. This relationship, however, has not been maintained, and at present the total leucocyte count is about 9,000, with only 44 per cent neutrophils and 50 per cent lymphocytes, the large lymphocytes predominating.

The patient left the hospital October 24, feeling well, but with a continuous elevation of temperature of about 100° F. Sixteen days later he returned, complaining of a board-like painful swelling in the left anterior abdominal wall, which gradually disappeared without suppuration. His hemoglobin, however, had receded to 42 per cent, the lowest recorded at any time, and the erythrocytes to 3,600,000. On November 14, 1919, transfusion of 500 cubic centimeters of citrated blood was made. Following this his improvement was steady; temperature and pulse became normal, appetite good, and his weight increased to 139 pounds, several pounds better than his best weight. On January 1, 1920, he returned to active duty and has continued on active duty to the present time.

At my request he presented himself for examination November 13, 1920, that is, about three weeks ago, or nearly fifteen months following the splenectomy. He is apparently in perfect health; weight 139 pounds; temperature and pulse normal; heart and lungs normal; no edema and no ascites. The liver dullness now extends fully to the costal border, showing that there has evidently been considerable regeneration of that organ; jaundice absent; blood-pressure 130-70. He has no dyspnea, being able to climb the hilly streets of Duluth without discomfort. He has worked steadily without asking favors, lifting, when called on, hundred-pound sacks without effort or distress.

For convenience of comparison the various blood findings, before and after the splenectomy, and at the times of transfusion, have been grouped in the accompanying table (Fig. 1)

The blood picture at present is: hemoglobin, 85 per cent; erythrocytes, 4,980,000; color-index, 0.85; leucocytes, 8,650; differential, polymorphonuclears, 44 per cent; lym-

phocytes, 50 per cent; large mononuclears, 3 per cent; transitionals, 3 per cent; eosinophils, 1 per cent.

It is thus seen that a relative lymphocytosis has recurred, and that the normal relationship of neutrophils to lymphocytes is even more markedly disturbed than prior to the splenectomy; in other words, that the blood findings, as concerns the leucocytes, have reverted to the infantile type. What this means, from the standpoint of prognosis, is an interesting speculation. Very little help in solving this question is to be obtained from the cases studied, because in only a few of them have repeated differential counts been made. One of Sherren's cases, after being in perfect health for over a year, suddenly died from hemorrhage. Unfortunately, in this case, no blood examination was made later than six weeks after her operation, but that showed a marked lymphocytosis (53 per cent with a proportional reduction in neutrophils to 42 per cent); the hemoglobin was 55 per cent. Nullifying this observation, however, are the blood findings in the cases of Kidd, Lissner, and Herrick, which were in perfect health nine and ten months after operation, when the blood examinations were made, and yet in all of them the relative lymphocytosis was marked. As long ago as 1901 Cabot called attention to the fact that in some splenectomies as much as five years were required to re-establish a normal differential leucocyte count. Herrick makes the same observation about the cases of Senator and Wolff.

Nor have I been able to get much light on this from the physiologists or hemotologists. One theory accounting for the lymphocytosis in these cases seems to me quite reasonable and plausible, as follows: The lymphocytes, especially the small ones, are concerned in tissue building and tissue regeneration, and for this reason we always find a relative lymphocytosis in childhood. Now, under certain conditions, in adult life, as following serious chronic infections recovered from, it is fair to assume that, the tissues having suffered marked degeneration, nature then applies her-

self to the problem of regeneration, and with this purpose in view, supplies the lymphocytes in increased number as tissue builders. I have come across several facts which seem to substantiate this theory: (1) In Minnesota one of the coldest states in the country a neutrophile percentage of 50 to 60, and a corresponding lymphocytosis is much more frequently found than the usual higher percentage of neutrophils as given in the text-books; (2) in Europe, since the second year of the war, apparently everyone has developed a relative lymphocytosis of from 30 to 50 per cent or more. No one has offered any deflnite explanation of this, but it has been ascribed to nutritional changes.

In my case it is interesting to note, in this connection, that the jaundice and ascites have disappeared and also that the liver dullness now extends to the costal arch, having quite appreciably increased over what was found before operation. I take it that these findings mean that nature has been very buisy regenerating tissue, and for this purpose has provided the necessary lymphocytes as tissue builders. If this theory has any foundation in fact, then the presence of lymphocytosis is a good rather than a bad prognostic sign. As long as regeneration continues the lymphocytosis will persist; when the need ceases, then the leucocytes will return to their normal adult ratio.

But more important, apparently, from the standpoint of prognosis, is a theory developed by Professor Downey, hematologist in the University of Minnesota and an authority on the blood. He has found invariably in cases of severe toxemias and of long-standing infections that the larger lymphocytes predominate and that their cytoplasm contains numerous coarse azure granules. When such findings are present in a given case, he suspects infection and degeneration as still going on somewhere in the body, although his observations are so far too few to allow him to speak with much positiveness on the subject. These findings are present in the slides of my patient's blood, and it will,

therefore, be of considerable interest to watch his further progress.

SUMMARY

1. Splenectomy offers the best chance of recovery from the otherwise fatal terminal stage of splenomegaly.

2. A plea is made for detailed histories of all cases of this type, subjected to splenectomy, and also for subsequent reports of progress at sufficiently late date after operating to determine the ultimate result as regards permanency of cure. Only in this way can judgment be formed as to the value of this procedure.

3. In the study of the blood findings, it is not sufficient, from the standpoint of prognosis, to record the differential white count; a more intensive study of the cell structure itself is essential.

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FOR DISCUSSION SEE PAGE 296

PRIMARY SARCOMA OF THE SPLEEN

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It is not strange, with the increasing prominence of the spleen in blood dyscrasias and other pathologic conditions during recent years, that the surgery of the spleen should abound in recent literature. Out of this work, however, few cases of sarcoma have been reported.

Bush[2] suggests that the reason for this is the "atomical protection from trauma by the position which the spleen enjoys, and by its inaccessibility by direct extensions along fascial planes."

Jepson and Albert[6] collected thirty-one cases of primary sarcoma in 1904, and Councilman[3] collected four more, and added one of his own in 1912. Three cases have been reported since that time.

The first case reported was credited to Fredreich in 1865. The majority of the reported cases lived from a few days up to six months. W. J. Mayo,[7] however reported a case well after seven years.

The symptoms consist principally of solid growth of the spleen, with pain and blood changes varying in degree.

The types recognized have been:

1. Fibrosarcoma.
2. Lymphosarcoma.
3. Small round-cell sarcoma.
4. Endothelial-cell sarcoma.

The writer's case is as follows:

Mrs. L. T., married, aged 40. Referred by Dr. Dudley Fulton. Menstruation began at 12; one miscarriage; ectopic, operated on; periods every three weeks; excessive

flow. She has had several nervous breakdowns; has been anemic for eight years; has had two Colles, fractures. Repair and uterine suspension eight years ago, followed by nervous breakdown. No typhoid, malaria, or injury to abdomen.

Wassermann, negative.

Studied at Johns Hopkins three years ago; diagnosed splenic anemia; spleen not much enlarged at that time. Splenectomy recommended and refused.

For about seven months has noticed a lump on the left side of the abdomen, associated with occasional pain, Swelling has increased rapidly, and pain became constant during the last month. Has had x-ray, light treatments and electrical therapy. Is constipated; has dyspnea on exertion, no vertigo; no numbness. Has lost fifteen pounds in four months.

Has been studied here by Drs. Dudley Fulton and Walter Brem independently. Each diagnosed splenic anemia, and recommended splenectomy.

Physical Examination: Pallor marked; lungs, heart, teeth, tonsils, thyroid, and pupils normal.

There is a tumor over the splenic region, extending to the level of the umbilicus and to one inch from the midline. It is tense and hard; slightly tender. The surface is irregular.

Temperature, 99.6°; pulse, 104.

Urine 1020, slightly acid; albumen, trace; sugar, negative; pus cells, occasional bacteria.

Hemoglobin	48 per cent
Red cells	3,840,000
Color-index	0.6
Leucocytes	6,900
No cells counted	100
Polymorphonclears	69
Small lymphocytes	29
Large lymphocytes	1
Transitional	1

On April 27 she suffered sudden excruciating pain in the left side, with increase in size and exquisite tenderness of the spleen. Her temperature was 102.5°; pulse, 122. Extreme prostration; partial collapse; and abdominal distension.

Fearing rupture of the spleen. or massive hemorrhage into it, operation was considered impervative. She reacted somewhat, and on May 31 she had blood transfusion and splenectomy.

On entering the abdomen through a left Bevan incision, the large mass was seen. It was hard in places and soft in others, especially soft toward the lower pole. This was thought to be the result of the recent infarcts, for at that time the sarcomatous element had not been considered. To it the stomach, transverse colon, and omentum were attached. It was in contact with the tail of the pancreas and left kidney, but easily separated from each.

The ligaments and adhesions to stomach and colon were separated; then the diaphragmatic adhesions were broken by the fingers. The spleen was dislocated, and the remaining cavity filled immediately with a large hot gauze pack (Mayo[7]) which was left in till the operation was completed.

The peritoneal reflexions were removed from the splenic pedicle, the pedicle ligated in sections with silk, back of double clamps, and the mass removed.

The liver was moderately enlarged; there were no nodules. Gall-bladder was normal.

She was much prostrated for the first four days, with normal temperature, but pulse ranging from 140 to 160, with poor quality. From that time her convalesence was uninterrupted.

The pathological study was made by Drs. Brem and Zeiler, who reported it an endothelial sarcoma. By reason of its rarity, a longitudinal section, 1 cm. in thickness, through the central portion of the entire spleen, was sent to Dr. W. G. MacCullen, at Johns Hopkins and I quote his letter to Dr. Brem:

The specimen of spleen which you sent me from Mrs. T., arrived while I was away, but I have had sections made from it since. The specimen shows great distortion of the spleen, as you noticed, by the encroachment upon it of a large mass of white tissue, which is largely necrotic and hemorrhagic. The splenic tissue which is left shows very clearly in the sections, and the tumor is very sharply outlined; nevertheless it runs in many places far between the venules, which are still recognizable in the edge of the tumor.

I think it is impossible to tell the exact origin of the tumor, although this would rather suggest that it might have arisen from the cells of the pulp. The tumor is uniform in its microscopical appearance everywhere, and is made up of a reticulum, which is filled with very large cells which are quite irregular in outline but which have rounded vesicular nucleoli. They are exactly alike everywhere one looks and are bound together more or less by their processes into a loose tissue. These cells are twice as large as the lymphocytes of the Malphigian bodies.

I think it must be spoken of as a sarcoma of the spleen, and, from what you tell me, of the case, it must have been primary there and entirely removed by the operation.

I assume that there were no blood changes of a leukemic character, although the clots in the vessels, seem to contain a great number of nucleated cells, which resemble those of the tumor. It is possible, however, that these might have gotten into the vein by accident. If there were leukemic changes one would be inclined to give the name leukosarcoma, although this would be an exceptional position for such a tumor."

After a period of seven months she gained twenty-five pounds, and is in better health than ever for over ten years.

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DISCUSSION ON THE TWO PRECEDING PAPERS

Dr. C. D. Lockwood (Pasadena, Calif.,): I reported before this Association three cases of advanced Banti's disease treated by splenectomy. There is one point in the technic which I wish to bring out,—that is, that the vessels of the

spleen should be ligated separately instead of *en masse*. This technic was followed in two of my cases. In one, however, the pedicle was ligated *en masse*. This man was very anemic, and when the spleen was removed almost collapsed; 77 c. c. of blood escaped from the spleen after its removal, and we conceived the idea of transfusing him with the blood from his own spleen. The blood was citrated and immediately introduced into his veins. I think he owed his life to this autotransfusion.

Dr. Sweetser (closing): I have nothing further to say, except to state that I have reported this case because so few cases in the third stage have been reported that have remained in such good health for so long a time.

DISEASES OF THE PANCREAS

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Interdependence of the upper abdominal digestive group has long been a theme of intense interest to the writer.

Opportunity to study stomach, liver, and gall-bladder lesions presents so frequently in the operating theater and in current literature on these organs, that one may become comparatively proficient in the management of disease of these organs. But the third member of the group, the pancreas, has hitherto proven more or less elusive and often set at naught the painstaking efforts of the clinician to interpret and relieve symptoms attributable to pathological processes in this organ.

All surgeons who have had considerable operative experience in this region of the body are familiar with the low grades of pancreatitis so frequently associated with chronic disease of the gallbladder.

Chronic Pancreatitis.—In chronic pancreatitis, one learns early to look to the dejecta for confirmatory evidence of the clinical diagnosis. The stool contains numerous undigested muscle fibers or nuclei and a putrescent fatty substance which emits an abundance of sulphuretted hydrogen gas.

Numerous small gas bubbles stud the surface, suggestive of active fermentation in the pale, odorous, trembling mass. Pain or discomfort, nausea, flatulence, and eructation of a peculiarly offensive character coming on soon after eating in a patient who expresses a distaste for fats and sweets and a craving for acids, should direct one's attention to the pancreas as a probable source of the symptoms.

Rapid loss of weight, hyperglycemia, glycosuria, and lack of ability to make a continued mental effort, added to the above, constitute a clinical picture easy of interpretation. Administration of a brisk saline cathartic at this time will bring away large light-colored offensive stools and symptomatic relief will follow.

Jaundice usually precedes the demonstrable lesion or is present in the course of the disease. A peculiar slate-colored hue of the skin is not infrequently present in chronic pancreatitis.

The past history of these patients will contain reference to one or more gall-bladder attacks, and, if in the surgical treatment of these patients, one will make a practice of gently palpating the head of the gland, after examining the common duct, he will invariably find an increase in the size and density of the gland substance. In this type of pancreatitis, very satisfactory results follow prolonged drainage, via cholecystotomy or cholecystenterostomy.

Many of these patients are mistakenly operated upon for gall-bladder disease, and the modern practice of cholecystectomy destroys the most useful ally in the surgical treatment of chronic pancreatitis.

If permanent drainage is desirable, an anastomosis between the gall-bladder and duodenum, jejunum, stomach, or large bowel, preference being given in the order named, will best serve the purpose.

Many years ago the writer called attention to the stormy post-operative recovery which occasionally follows operations in the upper right quadrant, and pointed out that it was due to trauma of the pancreas at operation. This is one of the privileged regions of the body second only to the neck in the exhibition of shock following trauma.

In dealing surgically with disease of the pancreas one should keep in mind the mechanical means for draining the secretions. In nearly 70 per cent of human beings the common duct runs through the head of the pancreas and is partly or wholly surrounded by gland substance.

This arrangement lends itself readily to obstruction of the duct by compression following edema or tumor formation in the head of the pancreas. There is an accessory duct with a separate opening into the duodenum in 50 per cent of the patients, which, if present, will afford some degree of relief when the duct of Wirsung is blocked.

Cicatrical contraction of fibrous bands resulting from a chronic pancreatitis, may cause transverse depressions in the surface of the gland and interfere with free drainage. A calculus impacted in the terminal common duct, is by far the most common cause of obstruction, as pointed out by Opie, who also demonstrated that infected bile was forced into the pancreatic duct in such instances giving rise to infection in the ducts and glandular substance.

Infection may also be conveyed to the pancreas through the lymph or blood stream in the absence of duct of obstruction. The course, duration, severity, and final outcome of the disease will largely depend upon the character of the infective agent, staphylococci seemingly being the most rapidly fatal to the patient.

Acute Pancreatitis.—Acute pancreatitis is ushered in by severe pain in the upper abdomen accompanied by nausea, vomiting, and collapse.

The patient is desperately ill, and nearly all patients suffering from the disease are admitted as stretcher cases. The succeeding hours are marked by increase in the intensity of the pain, and persistence in vomit-

ing large quantities of rope-like mucus stained with bile and, in the later stages, tinged with blood.

The musculature of the upper addominal wall is board-like, and the skin covering the region is hypersensitive. Constipation is almost always present in the acute cases, and this, in the presence of pain, vomiting, and distention, causes one to suspect intestinal obstruction, indeed, this is a most fruitful source of error in the diagnosis of the fulminating cases.

If the patient survives the attack for a week or ten days, diarrhea will take the place of constipation, and a diffuse swelling may be palpated in the region of the stomach, above or below the organ. Dilatation of the stomach and colon, which accompanies the localized peritonitis and is always present, may obscure the tumor until it is well advanced in size.

Severe muscular effects at vomiting intensify the pain, which is rapidly wrecking the patient's life.

The severity of the pain and shock are said to be due to the close relation of the pancreas to the solar plexus whence it derives its nerve supply.

Slight jaundice, present at the beginning of the attack, gradually deepens as the disease advances, sometimes taking on a bronze or slate-colored hue. In some instances the pinched anxious expression indicative of a spreading peritonitis is present on the first day of the illness.

The rapid, small pulse associated with acute pancreatitis is infinitely better as a clinical guide than the temperature curve, which may vary from 96° F. to 104° F.

In the very acute cases wherein large areas of the gland are involved, the temperature is subnormal, but, if the patient survives the primary shock, the temperature becomes irregular and the pulse-rate increases,

but the volume diminishes to the vanishing point, delirium supervenes, and death from toxemia follows in from forty-eight hours to five days.

The large tumors sometimes encountered in acute pancreatitis are principally made up of extravasated serum and blood.

Classification.—Classification of hemorrhagic, gangrenous, and suppurative pancreatitis, has but an academic interest; clinically they are as so many phases of infection, and the morbid appearance of the organ will correspond to the stage at which operation is instituted for relief.

Early recognition and prompt drainage will save some of these patients, but the mortality with or without operation is very high. In acute upper abdominal conditions simulating gall-bladder involvement or high intestinal obstruction, one should keep acute pancreatitis in mind during the physical examination. On opening the abdomen after perforation of the capsule has taken place one encounters a peculiar odorless, light-colored fluid in the peritoneal sac. The presence of yellow plagues of fat necrosis distributed over the surface of the mesentery is pathognomonic and clinches the diagnosis.

Marked cyanosis of the intestinal wall and change in the physical appearance of the omentum, which is dry and granular in appearance, have been pretty constantly observed in the perforative cases.

Necrotic masses and large quantities of pus have been successfully removed from patients who survived the acute stage, after the process had cooled and the patient's powers of resistance were in the ascendency.

Provision against destruction of surrounding structues by pancreatic enzymes is a difficult problem in the post-operative management of these patients.

The method of fixing a drainage tube in the sac wall after the fashion of placing a tube in the gall-bladder and protecting the surrounding skin by covering it with castor oil, serves a very good purpose.

Cyst of the Pancreas.—Clinicians are more familiar with cyst formation than with any other pathological condition affecting the pancreas, probably for the reason that greater opportunity presents and more time may be spent in studying these slowly growing tumors.

Trauma is said to be a causative factor in the production of pancreatic cysts, but accumulations of blood and inflammatory detritus in the lesser peritoneal sac will account for most of the so-called cysts following trauma.

Rupture of the pancreas may complicate the case, and the cyst content may show the chemical test of converting starch into sugar; and still this would not prove the case to be a true cyst of the pancreas.

It is highly probable that retention of secretions by incomplete obstruction of the duct with over-activity on the part of the secretory apparatus induced by the stimulant of a mild grade of inflammatory change, will account for the greater number of the slowly growing tumors in the hypogastrium which prove to be true cysts of the pancreas.

Artificial blocking by ligation of the duct is sometimes followed by atrophy of the organ, but this in no way negatives the theory of Opie as to the production of ranula of the pancreas as the essential element; infection is absent. These cysts grow slowly, consequently pain is rarely a prominent symptom.

They usually present above, but occasionally below, the stomach, and may be palpated as smooth, non-sensitive, slighty movable masses. They may attain an enormous size, cases being reported wherein two

gallons of fluid have been evacuated from one cyst. Attachment to surrounding structures by the thick walls of the sac renders removal of the cyst difficult or impossible.

Obstructive jaundice will be a prominent symptom in those patients wherein the common duct passes through the head of the pancreas; conversely jaundice may be absent if the duct joins with the common duct and enters the duodenum without passing through the head of the gland.

Laboratory findings will depend in a great measure upon the location and amount of gland tissue involved. The islands of Langerhans are the most resistent of all pancreatic cells to both infection and cancer.

If only the cells of the acini and ducts are involved hyperglycemia and glycosuria will be absent, and the carbohydrate metabolism but slightly or not at all affected. Marked ascites from pressure on the hepatic veins is present in some patients suffering from cyst of the pancreas.

Cyst of the kidney or omentum must be kept in mind in the differential diagnosis. Tumors of the pylorus, stomach and liver should be readily eliminated in the physical examination.

For obvious reasons the aspirating needle has no place in the scheme of diagnosis. In studying diseases of the pancreas, one should ever keep in mind a picture of the histological structure of the gland. There are three separate and distinct types of cells—those lining the ducts, those lining the acini, and those comprising the islands.

Cancer of the Pancreas.—Malignant disease of the pancreas is very insidious in the early stages and difficult of recognition. The head of the organ is the

most frequent site of cancer, and jaundice is one of the first signs to present. Pain is not very constant in the earlier stages, but becomes severe and paroxysmal in character when distention from obstruction of the ducts takes place.

In the absence of palpable tumors the most dependable sign is a peculiar type of discoloration of the skin of the patient; it is not the typical jaundice associated with common duct obstruction, but has a peculiar bluish cast admixed with jaundice comparable to the hue of the skin of one suffering a mild attack of caisson disease plus a slight jaundice.

Hillier and Goodale, after investigating the subject, conclude that the ducts and acini are more prone to malignancy than are the islands. They record instances wherein the islands were wholly surrounded by cancerous infiltration without producing any appreciable effect upon the carbohydrate metabolism.

In a very unusual case reported by Hale White the head and tail of the gland were simultaneously affected, but the intervening tissue of the body showed no malignant deposits.

One of the chief difficulties in the recognition of these growths lies in the size and location of the tumor. Symptomatically, they closely resemble common duct obstruction with this exception, the excruciating pain is absent. In the later stages the tumor may attain the size of one's fist and become firmly attached to surrounding structures. Intolerable itching of the skin robs the patient of his sleep and renders him very miserable, while the slow feeble pulse and extreme depression presage the inevitable doom of the patient.

Extensive involvement of the islands will be followed by glycosuria, numerous large fatty stools, loss of appetite, rapid emaciation, and death from toxemia.

While there is a constant tendency on the part of the neoplasm to become adherent to neighboring organs, still the latter are rarely implicated in the malignant process. The lymph distribution favors secondary deposits in the liver and lungs, but death usually takes place before the disease passes beyond the limits of the pancreas.

Operative Technic.—Growths in the pancreas have been successfully removed together with a large part of the gland. Coffey has devised a very ingenious method of providing drainage for the stump after resection by implanting it in an improvised pocket connected with the lumen of the intestine.

Five pretty good sized arteries enter the gland. This and the intimate relation of important anatomical structures renders free exposure of the field of prime importance when one is operating.

In a limited personal experience a long midline incision with division of the gastrocolic omentum has given a satisfactory exposure of the pancreas. If the stomach is prolapsed, one must either raise the organ to its usual position or expose the pancreas by dividing the gastrohepatic omentum.

The former route is preferable when expedient, as it gives a far better exposure of the field. The greater peritoneal cavity should be protected during the operation, but, if soiling has already taken place, ample provision for pelvic drainage must be made.

Multiple incisions of the gland employed for the relief of acute pancreatitis will be followed by considerable hemorrhage, which may be controlled by gauze packing.

Hertzler, in his excellent work on tumors, says removal of tumor of the pancreas is technically possible, but that it has met with little success.

THE RATIONALE OF REGIONAL ANESTHESIA

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It is of the utmost importance to regard an operative surgical undertaking, not simply as a technical, manual performance beginning with the incision and ending with an aseptic dressing, but, rather, as comprehending every step from the surgeon's introduction to the patient to the end of postoperative follow-up correspondence.

It is always desirable and, as a rule, possible to impart to the patient at the first meeting an enlivening sense of security to allay, to some extent, the phobias and delusions, and establish confidence by what Clifford Albutt calls the "personal ascendency of the physician."

The most successful surgeons instinctively (which, as Schofield notes, means simply by the action of the unconscious mind) adapt themselves in voice and manner to the needs of the patient before them. This natural gift is without doubt a great secret of success.

As to the operation itself, gentleness in its performance should have a broad interpretation. Thus the transportation of the patient to the operating-room should be made pleasant and comfortable, in so far as it is possible to do this.

The terror of the operating-room and the bad impression which the patient receives, owing to the observation of everything connected with the operation,

are removed or eliminated, if a mild, pre-operative narcotic be employed.

In the operating-room the patient should find all those conditions which conduce to a quiet, tranquil "mood." This embraces many things; for example, the illumination, if mellow, conduces to tranquility. Too strong a light will irritate as definitely as the noise of one scratching upon glass. A strong light, even if natural sunlight, is not always a good light, and intensely brilliant illumination annoys the patient, as well as the surgeon. It is not enough just to have light in the operating-room. Light is a raw material. What is needed is illumination, which is light controlled and directed, not merely spilled around.

In artificial illumination blue glass surrounding the source of light, provides a soft white, diffused artificial sunlight, most agreeable to surgeon and patient.

An atrocity of the operating-room is the glaring white wall. Every layman knows how the glistening snow destroys visual efficiency, and yet for years we provided this blinding white glare, with its disturbing reflexes, as an essential feature of the surgery. Turn a light full on a mirror, and all one sees is a dazzling glare. Light reflected from a glossy white wall has the same effect,—the glare shines direct into the eye and dazzles the little cameras of the retina, the pupils contract, and the eyes are strained. The soft, light, flat gray of the sky, if used on the walls without gloss or varnish contributes to a restful "mood."

While it may arouse suspicion in the patient to cover the eyes so that nothing is seen of the operating room, it is usually agreeable to the patient to have the eyes covered with a piece of cool, moist gauze during the operation itself.

If the operating-table is under a skylight or under the source of artificial illumination, the step of cover-

ing the eye conduces directly to repose and inclines the patient's thoughts away from the surgical operation itself.

One learns at the beginning of the use of regional anesthesia that to place the patient upon a hard metal table is an unnecessary cruelty. If the table is not made soft by pillows, there will be complaint of discomfort, and this can be corrected without, in any way, impairing the aseptic technic even of those who, before operating, are accustomed, as Dr. William Mayo says, "to incant the pagan gods of asepsis." A comfortable posture can always be provided, if the surgeon so wills.

Another source of annoyance and irritation to the patient is noise. The dropping of a pan, the clanging of instruments, or the blowing off of an autoclav during regional anesthesia is no less than a crime. Likewise, talking in the operating-room should be kept at the irreducible minimum, excepting that engaging and diverting conversation between the patient and a low-voiced nurse may be helpful. This is an operating-room note. Several of our patients have asked us not to talk. For this particular reason, regional anesthesia is put to the severest test when used in the teaching clinic. It is favored by soft-voiced, well-behaved assistants and silent visitors.

Everything should be done to preserve the mental tranquility of the patient. Thus the preparation of the field of operation under local anesthesia often requires some variation from the common methods applicable when inhalation anesthetics are used, if the patient's confidence is to remain unshaken and the principle of gentleness observed. These variations, however, need in nowise detract from the thoroughness of the preparation; for example, the area of skin sterilized should be of generous dimensions, insomuch

as the position of the towels, protecting against infection from the skin about the wound might, under certain circumstances, require changing or be shifted unintentionally. One must keep in mind that it is not a painless procedure to pin the towels to the skin with safety-pins or special forceps, such as those of Backhaus or Moynihan.

If one omits to anesthetize the skin widely at the beginning, a change of position of the towels will necessitate an interruption of the operation while the area of analgesia is being enlarged. This wide superficial analgesia is, of course, of great importance as a measure to insure painless retraction of the wound margins. In operations in certain special locations, for example, the scrotum, the use of regional anesthesia demands greater care, if an aseptic field is to be provided without upsetting the patient's mental and nervous repose.

In this region preparation of the field with iodine or alcohol or any other irritant, is objectionable since the burning thus produced may so excite the patient, and so destroy confidence as to militate greatly against success of the method. This objection can be overcome by scrupulously careful preparation with soap and water and bichloride. However, nearly all operations involving the scrotal contents can be executed through a high inguinal incision, and this in itself is a most important safeguard against infection from the scrotal skin.

Insomuch as one cannot spread iodine and alcohol promiscuously over such a portion of the patient's body, the protective towels should be pinned at frequent intervals about the line of incision in view of the smaller area of sterilization, although it should be noted that it is not often necessary to limit, in any way, the size of the sterilized area.

It is a profitable expenditure of time and patience to guard against the infliction of even the slightest pain at the beginning of induction of local anesthesia. To this end it seems worth while to blanch the skin over a very small area with an ethyl chloride spray before the first introduction of the needle, or, if the skin be loose enough, to benumb it by pressure between the thumb and forefinger of the operator's left hand, the first puncture being made with a small hypodermic needle into the skin thus compressed. It is the painstaking attention to such minor details which establishes confidence and sympathy and renders this work fairly fascinating to the patient and surgeon.

It is in my experience undesirable to question the patient at frequent intervals as to whether pain is being perceived. This applies especially in the case of suggestible individuals. The patient may thus be suggested into pain-perception. If we attempt to force pain perceptions to disappear they appear just as when we attempt to force sleep consciously we remain sleepless; if we attempt to force ourselves to be pleased we only become annoyed. The more force the superconscious will attempts to exercise, the greater will be the defeat. It is much better to suggest the patient into channels of thought remote from pain by apparently impromptu remarks upon subjects quite foreign to the operation, or to declare that the pain is disappearing. With suggestible individuals the mere reiteration that there is no pain aids anesthesia. It is also of importance that the surgeon show no anxiety or concern, because the patient is surely thereby suggested into alarm or panic. Reassurance under some circumstances may amount to deception, but this is justifiable and, moreover, agreeable to the patient, for, as Barnum said in his practical philosophy, "populus vult decipiri."

Recourse to music as an adjuvant to provide for the

operating theatre the tranquil mood, and for the patient the gentle abstraction so desirable in surgical undertakings upon conscious individuals, was suggested by the expressed wish of patients that the soft seductions of music might be employed to take the thoughts of the patient from the operation, providing this could be accomplished without turning the operator's thoughts from the very businesslike, practical matters with which he must of course be actively engaged.

Realizing that this subject is obviously quite refractory to analysis, and with trepidation appreciating how readily such a discussion might drop to the plane of the absurd, but basing the statement on personal experience, I believe I can say with the restraint of decent conservatism that the music which caresses the ear and soothes the fretted nerves of the patient need not becloud the clear thinking nor hinder the technical precision and thoroughness of the operator. Combarieu says that music is a special act of the intelligence intervening in the chaos of emotional life to bring it into order and beauty.

The patient is, in so far as cerebration is concerned, to some extent carried away by the music, drifting about in a shadowy world of sensations and memories. Other sensations than those of the operating-room are provided for, as Helmholtz says in the first pages of his book, "in music sensation is everything."

It can hardly be doubted that music influences the emotions, stimulating, depressing, soothing, irritating. It will be admitted that music induces reactions in the organism, as, for example, the shuddering of the periphery, which is supposed to be a sign of the impression of the sublime. It is surely true that music induces psychic and physiologic reactions, that it affects the respiratory, circulatory and nervous systems. If a

Schumann lied or a nocturne of Chopin or a soothing American folk song played, if you please, upon a victrola in an adjoining room, does in fact in selected cases induce mental repose and nerve and muscle relaxation on the patient's part, it is not absurd to make use of it, providing it does not deflect the thoughts of the surgeon or his aids. Of course, if the surgeon is not at all musical, the plan might fail, and, of course, it is not in disparagement of the culture and intellectuality of the surgeon to presume that many are not so musical as was Billroth, the friend of Mozart, who was as much at home with his violin as with the scalpel. Napoleon the first said that music disturbed his nervous system, and Grant hated music.

It is hoped that these remarks will not be interpreted as an attempt to encourage a therapeutics, based upon music. History abounds with instances of attempts to cure disease with music but these attempts were doubtless based upon the superstition that in the sick person dwelt an evil spirit which music put to flight. One is safely remote from such superstition in taking the position that if the patient, undergoing operation with regional anesthesia feels that appropriate music will divert the mind and relax the body, then the surgeon does a sensible, rather than a theatrical or absurd act in providing it.

It can hardly be denied that the personality of the surgeon enters deeply into the consideration of this subject. He must rule the patient with the rod of confidence and sympathy. His mind must direct and control in the greatest measure possible the mind and body of the patient. There is no quackery, no necromancy about this. It is merely appreciation of what De Fleury calls the pathology and hygiene of the intellect.

Even a bare reference to the influence of the mental factor may be distasteful to practical surgeons who

insist that their art rests upon a very material basis but who, nevertheless, make frequent use of this factor vaguely and often unconsciously. We prize too much our freedom from philosophies and mysteries to look upon that which distracts us from our physical studies as anything better than knavish quackery.

"Philosophy in medicine is not the fashion now. The stern, practical and scientific character of the medical school training, the mechanical and chemical plane on which our physiologies move; the strictly material nature of modern pathology all tend to foster the belief that any consideration of the psychic in medicine is archaic in character and futile in results." (Schofield: "Force of Mind"). Nevertheless, though one may not be able to measure or understand it fully, one comes daily to the belief that a fair valuation of the influence of mind over body and its relation to the psychology of the operating-room is of especial importance in the employment of regional anesthesia. Medical psychology belongs to our whole profession and surgeons cannot ignore it. (Crichton Browne.)

Tuke ("Mind and Body," 2d edition, vol. I, p. 14) says, "I want medical men who are in active practice to utilize this force, to yoke it to the chariot of the son of Apollo, and, rescuing it from eccentric orbits of quackery, force it to tread with measured steps the orderly paths of legitimate medicine."

Perhaps we have been too much inclined to think of psychic influence upon the sick as belonging strictly to the practice of quackery. Schofield ("The Force of Mind," p. 5) asks why in the name of Aesculapius, should the medical profession have to look to a quack for boldness and force. Is there to be no dignity and authority, no courage and aggressiveness in a physician's personality? He asks whether virtue does not lie in the boldness of the quack, in the force of assertion, or in both. Though the influence of mind over

mind is everywhere seen and felt, it is neglected or ignored in operating-rooms and at sick-beds. Among the most successful physicians "Our best have owned the rare dramatic power, which gives to sympathy its lifting hour." (S. Wier Mitchell, "The Physician").

A personality, gentle but strong and sincere, which takes the patient into its sympathetic embrace is almost, if not quite as desirable in a surgeon as professional learning and manual skill.

It was Crile who perhaps more than any other awakened in us a respect for personality in surgeons. His whole scheme of anoci-association, it seems to me, is based on personality, a program of gentleness, beginning with the first inspection of the patient and continuing until the patient leaves the hospital. A radiant, magnetic personality and buoyant spirit in the physician can do much at the outset to overcome the despair of hopeless patients with mind made up to die and to carry them through the anxious, doubting period of convalescence.

There is no doubt but that the imparting of hope, the radiation of cheer, the employment of patience and forbearance on the surgeon's part impose a tax upon him. The surgeon who habitually uses local anesthesia must give much of himself to his patient. The method can appeal only to those who are willing to share some of their surplus nervous energy with their patients, and who are willing to emphasize all of the apparently slight factors of kindness, precision and gentleness, and to proceed with the caution of a serpent and the patience of Job. It is in no way related to surgical showmanship.

I believe it does not imply a prejudiced viewpoint to say that, whereas regional anesthesia is only one of many useful methods of suspending pain perception, it is, nevertheless, one of the most useful of these

methods and, further, that its scope of usefulness is still not generally appreciated.

As a friend of local anesthesia, a discussion of its possibilities are, to me, more interesting than a discourse upon its limitations. Limitations it has of course, but these are less restricted than one unfamiliar with its possibilities might believe. For example an individual with sound heart, kidneys, and lungs has a better chance under general anesthesia, if extensive abdominal surgery is to be done, than if the abdominal operation be carried out under regional anesthesia, for the reason that such work can be executed more quickly and more thoroughly, if the patient is asleep; that is, inhalation anesthesia permits a more expeditious and, oftentimes, more complete operation. But, of course, not infrequently the condition of the big organs mentioned presents a distinct contra-indication to inhalation anesthesia, or even spinal anesthesia with its depression of blood pressure, and then local anesthesia comes forward as a boon, for practically every abdominal operation can be done, if need be, under local anesthesia.

In the case of goiter operations, if I may be pardoned for a dogmatic utterance, inhalation anesthesia is rarely useful. This, I believe, will become the view of more and more surgeons as time passes. In this field local anesthesia has, to be sure, some disadvantages. A few times in my own experience patients have become panic-stricken toward the close of the operation and by moving about have interfered somewhat with the surgeon's manipulations, rendering precise work very difficult of accomplishment. Under such circumstances the desirability of complete relaxation and unconsciousness is emphasized. This embarrassment, however, is of minor importance, as compared with the dangers of (1) postoperative pneumonia; (2) overtaxing the heart; (3) overtaxing the

kidneys; (4) increased danger through failure to block the sensory nerve paths, resulting in the needless consumption of nervous energy as explained by Crile; (5) injury of the recurrent laryngeal nerve; and (6) asphyxia of any degree.

Postoperative observation of the material of the Mayo Clinic indicates that the degree of improvement that follows thyroidectomy depends to a considerable degree on the extent of damage to the vital organs at the time of operation. If the damage to organs has been extensive, it is impossible to restore the patient to normal health. Here, again, we are reminded of the great importance of protecting the heart, lungs, and kidneys against overtaxation. As a factor assisting in the restoration of the normal metabolic balance following the operation, it is here submitted that the use of local anesthesia offsets to some degree the effects of the increased metabolism by bringing up the rate of food intake in the first few days following the thyroidectomy. The patient can take liquids or even house diets, beginning at once after the operation. In dehydrated patients, water or other fluids taken by the mouth render unnecessary the employment of proctoclysis, which, in toxic, thyroid cases is as a rule, more or less exciting.

If the patient is not permitted to take too much water by the mouth during the operation, there is little likelihood of vomiting either during or after the thyroid operation, and this is of practical interest as postoperative bleeding is as a rule due to postoperative vomiting and strangling.

Thus it is seen that the elimination of vomiting and the administration of food by the mouth immediately after operation have a bearing on the important question of metabolism.

Ochsner admonishes that surgeons who are inclined to be violent in their manipulations should perform

thyroidectomies under local anesthesia, with its enforced gentleness, since there is no doubt as to the likelihood of increased postoperative perversion of thyroid function, if the tissues are severely traumatized.

It has been mentioned by many men of great experience and recognized authority in goiter surgery that regional anesthesia should be employed in operations upon the very serious toxic cases only, such surgeons advocating ether or gas oxygen for the simple and mildly toxic goiters. It is not easy to understand their reasoning. If, as seems true, all are agreed that regional anesthesia is desirable when the safeguards which it provides are demanded, and if no one will contend that simple goiter cannot as a rule be operated on conveniently and safely under regional anesthesia, then why is it not a fair deduction to say that one is justified in developing one's skill by accumulating experience in operations upon mild cases, in order to be prepared to employ the regional anesthesia where it is demanded with the mastery which only experience can give. With experience come patience, enthusiasm, consistency, the unhesitating manner, invented tricks, and original ideas. One learns to observe psychologically correctly and to individualize.

So far as the psychic ordeal is concerned, this, in my experience has been less depressing with regional anesthesia than with general anesthesia. It has been said that patients come to the operating-room for operations under regional anesthesia in great mental distress and with badly broken general morale.

My experience may not be extensive enough to justify general deductions, but, nevertheless, I venture to contradict this statement, for I believe the reverse to be true, that is, patients are reassured by the surgeon's promise to operate without pain and without sleep-producing anesthesia. Let any surgeon ask him-

self the question whether he would not prefer, for the effect upon his morale, that his hernia, for example, be operated on under local anesthesia.

It need hardly be stated here that the dread of inhalation anesthesia is the backbone of the truss-makers business. Likewise, this same dread of general anesthesia will turn patients who otherwise would go unoperated on to the surgeons who make the most of the possibilities of the regional anesthesia method.

A very distinguished surgeon has recently said that he has not the time to perform prostatectomy under local anesthesia. This, I think should be taken literally. This man, one of the most brilliant surgeons in the nation is, no doubt, too busy to use local anesthesia for prostatectomy, although the additional time required is very slight. However, in this case, should not these old patients with crippled hearts and kidneys be turned over to those of reasonable skill who have time enough to provide for the patient the important safeguard given by local anesthesia.

I believe that the teaching of this great man in relation to this particular subject is bad. So brilliant is the virtuosoship of this operator, so inspiring is his personality that his visitors are thrilled by him into a state of mind in which they are prepared to believe anything which he says, and in which they would give little heed to the utterance of a plodding advocate of local anesthesia. Nevertheless, if the surgeon is willing to give something of himself to his patient, to make some sacrifice of his own stamina, he can safely operate, with local anesthesia,on a considerable proportion of prostatic hypertrophies, which under inhalation anesthesia, could not safely be operated on.

After infiltrating the periprostatic tissues through the perineum and anesthetizing the suprapubic covering with 1 per cent novacain and filling the bladder

with 2 per cent novacain or 3 per cent cocaine solution, suprapubic prostatectomy becomes a simple and safe procedure. It can even be done in the bed.

Allen in his book recalls the words of Hyppocrates: "Divinum est opus sedare dolorem." We have support of this in the record of the first anesthesia in which the Lord caused a deep sleep to fall upon Adam while a rib was excised. To this one might add that it is now quite human to subdue pain in surgery and with complete safety.

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